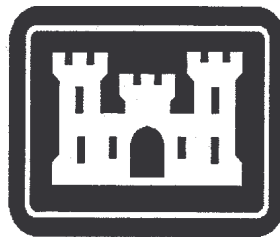


SOLICITATION NO. DACW37-02-B-0003

FLOOD CONTROL  
RED RIVER OF THE NORTH  
GRAND FORKS, NORTH DAKOTA

**CONSTRUCTION PROJECT DOCUMENTS  
FOR  
GRAND FORKS – PHASE 2 LEVEES**

May 2002



**US Army Corps  
of Engineers**  
St. Paul District

PROJECT TABLE OF CONTENTS

|       |  |
|-------|--|
| 00010 | SOLICITATION CONTRACT FORM               |
| 00100 | BIDDING SCHEDULE/INSTRUCTIONS TO BIDDERS |
| 00600 | REPRESENTATIONS & CERTIFICATIONS         |
| 00700 | CONTRACT CLAUSES                         |
| 00800 | SPECIAL CONTRACT REQUIREMENTS            |
| 00830 | ATTACHMENTS                              |

PROJECT TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

01000 GENERAL  
01090 SOURCES FOR REFERENCE PUBLICATIONS  
01270 MEASUREMENT AND PAYMENT  
01320 PROJECT SCHEDULE  
01330 SUBMITTAL PROCEDURES  
01410 ENVIRONMENTAL PROTECTION  
01451 CONTRACTOR QUALITY CONTROL  
01500 TEMPORARY CONSTRUCTION FACILITIES  
01568 NORTH DAKOTA POLLUTANT DISCHARGE ELIMINATION SYSTEM  
01572 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

DIVISION 02 - SITE WORK

02220 DEMOLITION  
02230 CLEARING AND GRUBBING  
02300 EARTHWORK  
02315 EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES  
02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITY SYSTEMS  
02373 GEOTEXTILE  
02382 ARTICULATING CONCRETE BLOCK REVETMENTS  
02388 STONE PROTECTION (RIPRAP)  
02464 METAL SHEET PILING  
02468 CYLINDER PILES  
02510 WATER DISTRIBUTION SYSTEM  
02531 SANITARY SEWERS  
02620 SUBDRAINAGE SYSTEM  
02630 STORM-DRAINAGE SYSTEM  
02721 RIGID BASE COURSE  
02741 ASPHALTIC CONCRETE PAVEMENT  
02754 CONCRETE PAVEMENTS FOR SMALL PROJECTS  
02760 FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS  
02763 PAVEMENT MARKINGS  
02770 CONCRETE SIDEWALKS AND CURBS AND GUTTERS  
02821 CHAIN LINK FENCES AND GATES  
02824 ORNAMENTAL FENCE  
02825 ORNAMENTAL SWING GATE  
02832 SEGMENTAL CONCRETE BLOCK RETAINING WALL  
02870 SITE FURNISHINGS  
02915 TRANSPLANTING EXTERIOR PLANT MATERIAL  
02920 SEEDING, SODDING, and TOPSOIL  
02923 SLOPE STABILIZATION  
02930 EXTERIOR PLANTING  
02935 EXTERIOR PLANT MATERIAL MAINTENANCE

DIVISION 03 - CONCRETE

03100 STRUCTURAL CONCRETE FORMWORK  
03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS  
03200 CONCRETE REINFORCEMENT  
03300 CAST-IN-PLACE STRUCTURAL CONCRETE  
03360 SIMULATED STONE MASONRY  
03413 PRECAST ARCHITECTURAL CONCRETE

DIVISION 04 - MASONRY

## Grand Forks Phase 2 Levees

04200 MASONRY

### DIVISION 05 - METALS

05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS  
05120 STRUCTURAL STEEL  
05300 STEEL DECKING  
05500 MISCELLANEOUS METAL  
05510 PIPE AND TUBE RAILINGS  
05615 STOPLOGS

### DIVISION 06 - WOODS & PLASTICS

06100 ROUGH CARPENTRY  
06200 FINISH CARPENTRY

### DIVISION 07 - THERMAL & MOISTURE PROTECTION

07311 ROOFING, STRIP SHINGLES  
07412 NON-STRUCTURAL METAL ROOFING  
07600 SHEET METALWORK, GENERAL  
07720 ROOF VENTILATORS  
07900 JOINT SEALING

### DIVISION 08 - DOORS & WINDOWS

08110 STEEL DOORS AND FRAMES  
08330 OVERHEAD ROLLING DOORS  
08520 ALUMINUM AND ENVIRONMENTAL CONTROL ALUMINUM WINDOWS  
08625 TUBULAR SKYLIGHTS  
08700 BUILDERS' HARDWARE  
08810 GLASS AND GLAZING

### DIVISION 09 - FINISHES

09260 GYPSUM BOARD SYSTEMS  
09310 CERAMIC TILE  
09900 PAINTING, GENERAL  
09915 COLOR SCHEDULE

### DIVISION 10 - SPECIALTIES

10170 PLASTIC TOILET COMPARTMENTS  
10430 EXTERIOR SIGNAGE  
10440 SIGNS  
10800 TOILET ACCESSORIES

### DIVISION 14 - CONVEYING SYSTEMS

14600 HOIST AND CRANES

### DIVISION 15 - MECHANICAL

15050 SLUICE GATES AND OPERATORS  
15060 PUMP DISCHARGE PIPELINES AND FLAP VALVES  
15161 ELECTRICAL PUMP (INSTALLATION)  
15250 MECHANICAL INSULATION  
15400 PLUMBING  
15500 HEATING, VENTILATION, AND AIR-CONDITIONING SYSTEMS

Grand Forks Phase 2 Levees

DIVISION 16 - ELECTRICAL

16120 INSULATED WIRE AND CABLE  
16239 ENGINE RADIATOR AIRFLOW-COOLED LOAD BANK  
16264 DIESEL-GENERATOR SET  
16415 ELECTRICAL WORK, INTERIOR  
16528 EXTERIOR LIGHTING  
16600 ELECTRIC DRYERS

-- End of Project Table of Contents --

|  |   |   |   |                           |
|--|---|---|---|---------------------------|
| <b>SOLICITATION, OFFER,<br/>AND AWARD</b><br><i>(Construction, Alteration, or Repair)</i>  | 1. SOLICITATION NO.<br>DACW37-02-B-0003 | 2. TYPE OF SOLICITATION<br><input checked="checked" type="checkbox"/> SEALED BID (IFB)<br><input type="checkbox"/> NEGOTIATED (RFP) | 3. DATE ISSUED<br>07-Jun-2002   | PAGE OF PAGES<br>1 OF 173 |
| <b>IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.</b>  |   |   |   |                           |
| 4. CONTRACT NO.  |   | 5. REQUISITION/PURCHASE REQUEST NO.<br>W81G67-1334-9418   |   | 6. PROJECT NO.            |
| 7. ISSUED BY<br>CONTRACTING DIVISION<br>USACE - ST PAUL<br>190 5TH STREET E<br>ST PAUL MN 55101-1638<br><br>TEL:                      FAX: 651-290-5706  |   | CODE<br>DACW37  | 8. ADDRESS OFFER TO <i>(If Other Than Item 7)</i> CODE<br><br><div style="text-align: center; padding: 10px;"> <b>See Item 7</b> </div><br>TEL:                      FAX: |                           |
| 9. FOR INFORMATION CALL:   | A. NAME<br>TAMMY M MOORE                |   | B. TELEPHONE NO. <i>(Include area code)</i> <b>(NO COLLECT CALLS)</b><br>651-290-5408   |                           |
| <b>SOLICITATION</b>  |   |   |   |                           |
| <b>NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".</b>  |   |   |   |                           |
| 10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS <i>(Title, identifying no., date):</i><br><br>Phase 2 Levees, Grand Forks, North Dakota. Work includes all plant, labor, materials and supplies to construct four reaches of flood barrier in Grand Forks. Principle features of work include approximately 10,000 linear feet of earth levee, approximately 5,500 linear feet of concrete floodwall, three closure structures, interior storm drainage including storm sewerage, four pump stations, two gated closures, one stormwater detention pond, three pump stations, recreation facilities including one building, park equipment, trails and landscaping.<br><br>This procurement is issued unrestricted under the Small Business Demonstration Program (Public Law 100-656) The North American Industrial Classification System Code (NAICS) is 234990 with a Small Business Size Standard of \$28.5 million. The estimated order of magnitude of construction in terms of physical characteristics and estimated price range is more than \$10,000,000. |   |   |   |                           |
| 11. The Contractor shall begin performance within <u>10</u> calendar days and complete it within <u>730</u> calendar days after receiving<br><input type="checkbox"/> award, <input checked="checked" type="checkbox"/> notice to proceed. This performance period is <input checked="checked" type="checkbox"/> mandatory, <input type="checkbox"/> negotiable. <i>(See Section 0700 .)</i>   |   |   |   |                           |
| 12 A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS?<br><i>(If "YES," indicate within how many calendar days after award in Item 12B.)</i><br><input checked="checked" type="checkbox"/> YES <input type="checkbox"/> NO  |   |   | 12B. CALENDAR DAYS<br><br>10  |                           |
| 13. ADDITIONAL SOLICITATION REQUIREMENTS:<br><br>A. Sealed offers in original and <u>2</u> copies to perform the work required are due at the place specified in Item 8 by <u>14:00:00</u> <i>(hour)</i> local time <u>7/9/02</u> <i>(date)</i> . If this is a sealed bid solicitation, offers must be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.<br><br>B. An offer guarantee <input checked="checked" type="checkbox"/> is, <input type="checkbox"/> is not required.<br><br>C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.<br><br>D. Offers providing less than <u>60</u> calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.  |   |   |   |                           |

|  |  |                                       |           |      |  |  |  |                             |                 |  |      |
|--|--|---------------------------------------|-----------|------|--|--|--|-----------------------------|-----------------|--|------|
| <b>SOLICITATION, OFFER, AND AWARD (Continued)</b><br><i>(Construction, Alteration, or Repair)</i>  |  |                                       |           |      |  |  |  |                             |                 |  |      |
| <b>OFFER (Must be fully completed by offeror)</b>  |  |                                       |           |      |  |  |  |                             |                 |  |      |
| 14. NAME AND ADDRESS OF OFFEROR <i>(Include ZIP Code)</i>  |  |                                       |           |      | 15. TELEPHONE NO. <i>(Include area code)</i>   |  |  |                             |                 |  |      |
|  |  |                                       |           |      | 16. REMITTANCE ADDRESS <i>(Include only if different than Item 14)</i>   |  |  |                             |                 |  |      |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 20%;">CODE</div> <div style="width: 30%;">FACILITY CODE</div> </div>   |  |                                       |           |      | <b>See Item 14</b>   |  |  |                             |                 |  |      |
|  |  |                                       |           |      |  |  |  |                             |                 |  |      |
| 17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within _____ calendar days after the date offers are due. <i>(Insert any number equal to or greater than the minimum requirements stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)</i>  |  |                                       |           |      |  |  |  |                             |                 |  |      |
| AMOUNTS  |  | SEE SCHEDULE OF PRICES                |           |      |  |  |  |                             |                 |  |      |
| 18. The offeror agrees to furnish any required performance and payment bonds.  |  |                                       |           |      |  |  |  |                             |                 |  |      |
| 19. ACKNOWLEDGMENT OF AMENDMENTS<br><i>(The offeror acknowledges receipt of amendments to the solicitation -- give number and date of each)</i>  |  |                                       |           |      |  |  |  |                             |                 |  |      |
| AMENDMENT NO.  |  |                                       |           |      |  |  |  |                             |                 |  |      |
| DATE   |  |                                       |           |      |  |  |  |                             |                 |  |      |
| 20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER <i>(Type or print)</i>  |  |                                       |           |      | 20B. SIGNATURE   |  |  |                             | 20C. OFFER DATE |  |      |
| <b>AWARD (To be completed by Government)</b>   |  |                                       |           |      |  |  |  |                             |                 |  |      |
| 21. ITEMS ACCEPTED:<br><div style="font-size: 24pt; font-weight: bold; margin-top: 10px;">SEE SCHEDULE</div>   |  |                                       |           |      |  |  |  |                             |                 |  |      |
| 22. AMOUNT   |  | 23. ACCOUNTING AND APPROPRIATION DATA |           |      |  |  |  |                             |                 |  |      |
| 24. SUBMIT INVOICES TO ADDRESS SHOWN IN<br><i>(4 copies unless otherwise specified)</i>  |  |                                       |           | ITEM |  | 25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO<br><input type="checkbox"/> 10 U.S.C. 2304(c) <input type="checkbox"/> 41 U.S.C. 253(c) |  |                             |                 |  |      |
| 26. ADMINISTERED BY  |  |                                       | CODE      |      |  |  |  | 27. PAYMENT WILL BE MADE BY |                 |  | CODE |
|  |  |                                       |           |      |  |  |  |                             |                 |  |      |
| CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE  |  |                                       |           |      |  |  |  |                             |                 |  |      |
| <input type="checkbox"/> 28. NEGOTIATED AGREEMENT <i>(Contractor is required to sign this document and return _____ copies to issuing office.)</i> Contractor agrees to furnish and deliver all items or perform all work, requisitions identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications or incorporated by reference in or attached to this contract. |  |                                       |           |      | <input type="checkbox"/> 29. AWARD <i>(Contractor is not required to sign this document.)</i><br>Your offer on this solicitation, is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary. |  |  |                             |                 |  |      |
| 30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN <i>(Type or print)</i>  |  |                                       |           |      | 31A. NAME OF CONTRACTING OFFICER <i>(Type or print)</i>  |  |  |                             |                 |  |      |
| 30B. SIGNATURE   |  |                                       | 30C. DATE |      |  | 31B. UNITED STATES OF AMERICA BY   |  |                             | 31C. AWARD DATE |  |      |

## TABLE OF CONTENTS

|  |           |
|--|-----------|
| <b>TABLE OF CONTENTS .....</b>   | <b>3</b>  |
| <b>SECTION 00010 SOLICITATION CONTRACT FORM.....</b>   | <b>8</b>  |
| <b>PUMP STATION C-1 .....</b>  | <b>8</b>  |
| <b>PUMP STATION D-3 .....</b>  | <b>9</b>  |
| <b>PUMP STATION E-1.....</b>   | <b>10</b> |
| <b>GATED OUTLET F-1.....</b>   | <b>11</b> |
| <b>BELMONT COULEE (SUNBEAM) RESTROOM .....</b>   | <b>12</b> |
| <b>CLOSURE STRUCTURES .....</b>  | <b>13</b> |
| <b>LEVEE-STATION 151+90 TO 181 + 28 .....</b>  | <b>13</b> |
| <b>LEVEE - STATION 224+50 TO 237+03 .....</b>  | <b>18</b> |
| <b>LEVEE - STATION 355+00 TO 409+90 .....</b>  | <b>26</b> |
| <b>LINCOLN PARK GOLF COURSE .....</b>  | <b>34</b> |
| <b>SECTION 00100 BIDDING SCHEDULE/INSTRUCTIONS TO BIDDERS .....</b>  | <b>39</b> |
| 52.204-6 DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (JUN 99) .....  | 39        |
| 52.209-4001 BIDDER'S QUALIFICATIONS (APR 1984) FAR 9.105-1 .....   | 39        |
| 52.214-1 SOLICITATION DEFINITIONS--SEALED BIDDING (JUL 1987).....  | 40        |
| 52.214-3 AMENDMENTS TO INVITATIONS FOR BIDS (DEC 1989).....  | 40        |
| 52.214-4 FALSE STATEMENTS IN BIDS (APR 1984) .....   | 40        |
| 52.214-5 SUBMISSION OF BIDS (MAR 1997) .....   | 40        |
| 52.214-6 EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984).....  | 41        |
| 52.214-7 LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS (NOV 1999) .....                                     | 41        |
| 52.214-18 PREPARATION OF BIDS--CONSTRUCTION (APR 1984).....  | 42        |
| 52.214-19 CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION (AUG 1996) .....  | 42        |
| 52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991) .....  | 43        |
| 52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991) .....   | 43        |
| 52.214-4001 INQUIRIES - BID INFORMATION .....  | 43        |
| 52.214-4002 ALL OR NONE QUALIFICATIONS (APR 1984) FAR 14.404-5 .....   | 43        |
| 52.225-13 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (JUL 2000) .....   | 43        |
| 52.233-2 SERVICE OF PROTEST (AUG 1996).....  | 44        |
| 52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995) .....   | 44        |
| 52.236-4002 WORK PERFORMED BY THE CONTRACTOR .....   | 44        |
| 52.236-4005 UNAVAILABILITY OF UTILITY SERVICES.....  | 45        |
| 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998) .....  | 45        |
| <b>SECTION 00600 REPRESENTATIONS &amp; CERTIFICATIONS .....</b>  | <b>46</b> |
| 52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985) .....   | 46        |
| 52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN<br>FEDERAL TRANSACTIONS (APR 1991)..... | 47        |
| 52.204-3 TAXPAYER IDENTIFICATION (OCT 1998) .....  | 47        |



|                                       |   |           |
|---------------------------------------|---|-----------|
| 52.204-5                              | WOMEN-OWNED BUSINESS (OTHER THAN SMALL BUSINESS) (MAY 1999)   | 49        |
| 52.209-5                              | CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (DEC 2001)                      | 49        |
| 52.219-1                              | SMALL BUSINESS PROGRAM REPRESENTATIONS (MAY 2001) ALTERNATE I (OCT 2000)  | 50        |
| 52.219-2                              | EQUAL LOW BIDS. (OCT 1995)  | 52        |
| 52.219-19                             | SMALL BUSINESS CONCERN REPRESENTATION FOR THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM (OCT 2000)                       | 52        |
| 52.222-22                             | PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (FEB 1999)  | 53        |
| 52.223-13                             | CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 2000)  | 53        |
| 52.225-11                             | BUY AMERICAN ACT--BALANCE OF PAYMENTS PROGRAM--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (DEC 2001)                             | 54        |
| 52.232-38                             | SUBMISSION OF ELECTRONIC FUNDS TRANSFER INFORMATION WITH OFFER (MAY 1999)   | 57        |
| 252.209-7001                          | DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)  | 57        |
| 252.247-7022                          | REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)  | 58        |
| <b>SECTION 00700 CONTRACT CLAUSES</b> |   | <b>59</b> |
| 52.202-1                              | DEFINITIONS (DEC 2001) --ALTERNATE I (MAY 2001)   | 59        |
| 52.202-4001                           | DEFINITIONS (MAY 1995) EFARS PART 2.101   | 60        |
| 52.203-3                              | GRATUITIES (APR 1984)   | 61        |
| 52.203-5                              | COVENANT AGAINST CONTINGENT FEES (APR 1984)   | 61        |
| 52.203-7                              | ANTI-KICKBACK PROCEDURES. (JUL 1995)  | 62        |
| 52.203-8                              | CANCELLATION, RESCISSION, AND RECOVERY OF FUNDS FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)   | 63        |
| 52.203-10                             | PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)   | 64        |
| 52.203-12                             | LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JUN 1997)   | 65        |
| 52.204-4                              | PRINTED OR COPIED DOUBLE-SIDED ON RECYCLED PAPER (AUG 2000)   | 69        |
| 52.209-6                              | PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (JUL 1995) | 70        |
| 52.211-10                             | COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984)  | 70        |
| 52.211-12                             | LIQUIDATED DAMAGES--CONSTRUCTION (SEP 2000)   | 70        |
| 52.211-13                             | TIME EXTENSIONS (SEP 2000)  | 71        |
| 52.211-18                             | VARIATION IN ESTIMATED QUANTITY (APR 1984)  | 71        |
| 52.214-26                             | AUDIT AND RECORDS--SEALED BIDDING. (OCT 1997)   | 71        |
| 52.214-27                             | PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING. (OCT 1997)                                     | 72        |
| 52.214-28                             | SUBCONTRACTOR COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING. (OCT 1997)   | 74        |
| 52.216-1                              | TYPE OF CONTRACT (APR 1984)   | 74        |
| 52.219-4                              | NOTICE OF PRICE EVALUATION PREFERENCE FOR HUBZONE SMALL BUSINESS CONCERNS (JAN 1999)  | 75        |
| 52.219-8                              | UTILIZATION OF SMALL BUSINESS CONCERNS (OCT 2000)   | 76        |
| 52.219-9                              | SMALL BUSINESS SUBCONTRACTING PLAN (OCT 2001)   | 77        |
| 52.219-16                             | LIQUIDATED DAMAGES-SUBCONTRACTING PLAN (JAN 1999)   | 82        |
| 52.222-1                              | NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (FEB 1997)   | 82        |
| 52.222-3                              | CONVICT LABOR (AUG 1996)  | 82        |
| 52.222-4                              | CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION. (SEP 2000)  | 83        |
| 52.222-6                              | DAVIS-BACON ACT (FEB 1995)  | 84        |
| 52.222-7                              | WITHHOLDING OF FUNDS (FEB 1988)   | 85        |
| 52.222-8                              | PAYROLLS AND BASIC RECORDS (FEB 1988)   | 85        |
| 52.222-9                              | APPRENTICES AND TRAINEES (FEB 1988)   | 87        |

|           |   |     |
|-----------|---|-----|
| 52.222-10 | COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)  | 88  |
| 52.222-11 | SUBCONTRACTS (LABOR STANDARDS (FEB 1988)  | 88  |
| 52.222-12 | CONTRACT TERMINATION--DEBARMENT (FEB 1988)  | 88  |
| 52.222-13 | COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)  | 88  |
| 52.222-14 | DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)  | 89  |
| 52.222-15 | CERTIFICATION OF ELIGIBILITY (FEB 1988)   | 89  |
| 52.222-21 | PROHIBITION OF SEGREGATED FACILITIES (FEB 1999)   | 89  |
| 52.222-23 | NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL<br>EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION (FEB 1999)      | 89  |
| 52.222-26 | EQUAL OPPORTUNITY (FEB 1999)  | 90  |
| 52.222-27 | AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (FEB<br>1999)   | 92  |
| 52.222-35 | EQUAL OPPORTUNITY FOR SPECIAL DISABLED VETERANS, VETERANS OF THE<br>VIETNAM ERA AND OTHER ELIGIBLE VETERANS (DEC 2001)  | 95  |
| 52.222-36 | AFFIRMATIVE ACTION FOR WORKERS WITH DISABILITIES (JUN 1998)   | 98  |
| 52.222-37 | EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS, VETERANS OF THE<br>VIETNAM ERA, AND OTHER ELIGIBLE VETERANS (DEC 2001) | 100 |
| 52.223-5  | POLLUTION PREVENTION AND RIGHT-TO-KNOW INFORMATION (APR 1998)   | 101 |
| 52.223-6  | DRUG-FREE WORKPLACE (MAY 2001)  | 101 |
| 52.223-14 | TOXIC CHEMICAL RELEASE REPORTING (OCT 2000)   | 102 |
| 52.225-13 | RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (JUL 2000)  | 103 |
| 52.226-1  | UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC<br>ENTERPRISES (JUN 2000)                                 | 104 |
| 52.227-1  | AUTHORIZATION AND CONSENT (JUL 1995)  | 105 |
| 52.227-2  | NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT<br>(AUG 1996)   | 105 |
| 52.227-4  | PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984)   | 106 |
| 52.228-1  | BID GUARANTEE (SEP 1996)  | 106 |
| 52.228-2  | ADDITIONAL BOND SECURITY (OCT 1997)   | 106 |
| 52.228-11 | PLEDGES OF ASSETS (FEB 1992)  | 107 |
| 52.228-14 | IRREVOCABLE LETTER OF CREDIT (DEC 1999)   | 107 |
| 52.228-15 | PERFORMANCE AND PAYMENT BONDS--CONSTRUCTION (JUL 2000)-   | 111 |
| 52.229-3  | FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)  | 112 |
| 52.229-5  | TAXES--CONTRACTS PERFORMED IN U.S. POSSESSIONS OR PUERTO RICO (APR 1984)  | 112 |
| 52.232-5  | PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 1997)  | 113 |
| 52.232-17 | INTEREST (JUNE 1996)  | 115 |
| 52.232-23 | ASSIGNMENT OF CLAIMS (JAN 1986) - ALTERNATE I (APR 1984)  | 116 |
| 52.232-27 | PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (MAY 2001)  | 116 |
| 52.232-33 | PAYMENT BY ELECTRONIC FUNDS TRANSFER—CENTRAL CONTRACTOR<br>REGISTRATION (MAY 1999)                                      | 122 |
| 52.233-1  | DISPUTES. (DEC 1998)  | 124 |
| 52.233-3  | PROTEST AFTER AWARD (AUG. 1996)   | 125 |
| 52.236-1  | PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984)  | 126 |
| 52.236-2  | DIFFERING SITE CONDITIONS (APR 1984)  | 126 |
| 52.236-3  | SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)   | 127 |
| 52.236-4  | PHYSICAL DATA (APR 1984)  | 127 |
| 52.236-5  | MATERIAL AND WORKMANSHIP (APR 1984)   | 128 |
| 52.236-6  | SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)  | 128 |
| 52.236-7  | PERMITS AND RESPONSIBILITIES (NOV 1991)   | 128 |
| 52.236-8  | OTHER CONTRACTS (APR 1984)  | 129 |
| 52.236-9  | PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND<br>IMPROVEMENTS (APR 1984)                     | 129 |
| 52.236-10 | OPERATIONS AND STORAGE AREAS (APR 1984)   | 129 |
| 52.236-11 | USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)   | 130 |

|  |   |            |
|--|---|------------|
| 52.236-12  | CLEANING UP (APR 1984)  | 130        |
| 52.236-13  | ACCIDENT PREVENTION (NOV 1991) – ALTERNATE I (NOV 1991)   | 130        |
| 52.236-17  | LAYOUT OF WORK (APR 1984)   | 131        |
| 52.236-21  | SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997)   | 131        |
| 52.236-26  | PRECONSTRUCTION CONFERENCE (FEB 1995)   | 132        |
| 52.242-13  | BANKRUPTCY (JUL 1995)   | 133        |
| 52.243-4   | CHANGES (AUG 1987)  | 133        |
| 52.244-6   | SUBCONTRACTS FOR COMMERCIAL ITEMS (DEC 2001)  | 134        |
| 52.245-1   | PROPERTY RECORDS (APR 1984)   | 134        |
| 52.245-2   | GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS) (DEC 1989)  | 135        |
| 52.246-21  | WARRANTY OF CONSTRUCTION (MAR 1994)   | 137        |
| 52.248-3   | VALUE ENGINEERING--CONSTRUCTION (FEB 2000)  | 138        |
| 52.249-2   | TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SEP 1996) -<br>ALTERNATE I (SEP 1996)                                  | 141        |
| 52.249-10  | DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)   | 144        |
| 52.253-1   | COMPUTER GENERATED FORMS (JAN 1991)   | 145        |
| 252.201-7000                                       | CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)   | 145        |
| 252.203-7001                                       | PROHIBITION ON PERSONS CONVICTED OF FRAUD OR OTHER DEFENSE-<br>CONTRACT-RELATED FELONIES (MAR 1999)                                 | 145        |
| 252.203-7002                                       | DISPLAY OF DOD HOTLINE POSTER (DEC 1991)  | 147        |
| 252.204-7000                                       | DISCLOSURE OF INFORMATION (DEC 1991)  | 147        |
| 252.204-7003                                       | CONTROL OF GOVERNMENT PERSONNEL WORK PRODUCT (APR 1992)   | 147        |
| 252.204-7004                                       | REQUIRED CENTRAL CONTRACTOR REGISTRATION.(NOV 2001)   | 148        |
| 252.205-7000                                       | PROVISION OF INFORMATION TO COOPERATIVE AGREEMENT HOLDERS (DEC<br>1991)   | 149        |
| 252.209-7000                                       | ACQUISITION FROM SUBCONTRACTORS SUBJECT TO ONSITE INSPECTION UNDER<br>THE INTERMEDIATE-RANGE NUCLEAR FORCES (INF) TREATY (NOV 1995) | 149        |
| 252.209-7003                                       | COMPLIANCE WITH VETERANS' EMPLOYMENT REPORTING REQUIREMENTS (MAR<br>1998)   | 149        |
| 252.209-7004                                       | SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE<br>GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)                       | 150        |
| 252.219-7003                                       | SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS<br>SUBCONTRACTING PLAN (DOD CONTRACTS) (APR. 1996)                        | 150        |
| 252.223-7006                                       | PROHIBITION ON STORAGE AND DISPOSAL OF TOXIC AND HAZARDOUS<br>MATERIALS (APR 1993)  | 151        |
| 252.225-7012                                       | PREFERENCE FOR CERTAIN DOMESTIC COMMODITIES (AUG 2000)  | 151        |
| 252.225-7031                                       | SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)   | 152        |
| 252.227-7033                                       | RIGHTS IN SHOP DRAWINGS (APR 1966)  | 153        |
| 252.231-7000                                       | SUPPLEMENTAL COST PRINCIPLES (DEC 1991)   | 153        |
| 252.236-7001                                       | CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (AUG 2000)  | 153        |
| 252.236-7008                                       | CONTRACT PRICES - BIDDING SCHEDULES. (DEC 1991)   | 154        |
| 252.242-7000                                       | POSTAWARD CONFERENCE (DEC 1991)   | 154        |
| 252.243-7001                                       | PRICING OF CONTRACT MODIFICATIONS (DEC 1991)  | 154        |
| 252.243-7002                                       | REQUESTS FOR EQUITABLE ADJUSTMENT (MAR 1998)  | 155        |
| 252.246-7000                                       | MATERIAL INSPECTION AND RECEIVING REPORT (DEC 1991)   | 155        |
| 252.247-7023                                       | TRANSPORTATION OF SUPPLIES BY SEA (MAR 2000)  | 155        |
| 252.247-7024                                       | NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY SEA (MAR 2000)  | 158        |
| 252.248-7000                                       | PREPARATION OF VALUE ENGINEERING CHANGE PROPOSALS (MAY 1994)  | 159        |
| <b>SECTION 00800 SPECIAL CONTRACT REQUIREMENTS</b> |   | <b>160</b> |
| 52.000-4004  | PARTNERING  | 160        |
| 52.212-4003  | TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (OCT 1989) ER 415-1-15   | 160        |
| 52.212-5000  | EVALUATION OF SUBDIVIDED ITEMS (MAR 1995)--EFARS  | 161        |
| 52.212-5001  | VARIATIONS IN ESTIMATED QUANTITIES, SUBDIVIDED ITEMS  | 161        |

|             |   |     |
|-------------|---|-----|
| 52.214-5000 | ARITHMETIC DISCREPANCIES – EFARS.....   | 161 |
| 52.228-4002 | INSURANCE .....   | 162 |
| 52.228-4022 | REQUIREMENT FOR BID GUARANTEE (FAR 28.101-2) .....                                    | 162 |
| 52.231-5000 | EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE.....                               | 162 |
| 52.232-4004 | INVOICE PROCEDURES .....  | 163 |
| 52.232-5001 | CONTINUING CONTRACTS (MAR 1995)—EFARS .....   | 163 |
| 52.236-15   | SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984).....                                  | 165 |
| 52.236-16   | QUANTITY SURVEYS (APR 1984) - ALTERNATE I (APR 1984).....                             | 165 |
| 52.236-4006 | SAFETY AND HEALTH REQUIREMENTS MANUAL INTERIM CHANGES, EM 385-1-1<br>(APR 2001) ..... | 166 |
| 52.236-4012 | MATERIAL SOURCES .....  | 166 |
| 52.236-4014 | PURCHASE ORDERS .....   | 166 |
| 52.236-4061 | OBSTRUCTION OF CHANNEL .....  | 166 |
| 52.239-4001 | YEAR 2000 COMPLIANCE (FAR 39.106) (JUL 1998).....                                     | 167 |
| 52.242-14   | SUSPENSION OF WORK (APR 1984) .....   | 167 |
| 52.245-2    | GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS) (DEC 1989).....                           | 167 |
| 52.245-3    | IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY (APR 1984).....                       | 170 |
| 52.245-19   | GOVERNMENT PROPERTY FURNISHED "AS IS" (APR 1984) .....                                | 170 |
| 52.245-4002 | GOVERNMENT-FURNISHED PROPERTY IDENTIFICATION AND LOCATION .....                       | 171 |
| 52.246-12   | INSPECTION OF CONSTRUCTION (AUG 1996).....  | 171 |
| 52.249-5000 | BASIS FOR SETTLEMENT OF PROPOSALS .....   | 172 |
| 52.236-7000 | MODIFICATION PROPOSALS - PRICE BREAKDOWN. (DEC 1991) .....                            | 173 |

**SECTION 00010 Solicitation Contract Form**

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0001    | BONDS             | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES             | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------------------|----------|----------|------------|--------|
| 0002    | PRECONSTRUCTION DAMAGE SURVEY | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

**PUMP STATION C-1**

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0003    | SITE WORK         | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0004    | STRUCTURE         | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0005    | ELECTRICAL        | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0006    | MECHANICAL        | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES  | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--------------------|----------|----------|------------|--------|
| 0007    | ELECTRICAL SERVICE | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0008    | SLUICE GATES      | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0009    | INTERIOR DRAINAGE | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

**PUMP STATION D-3**

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0010    | SITE WORK         | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0011    | STRUCTURE         | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0012    | ELECTRICAL        | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0013    | MECHANICAL        | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES  | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--------------------|----------|----------|------------|--------|
| 0014    | ELECTRICAL SERVICE | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0015    | SLUICE GATES      | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0016    | INTERIOR DRAINAGE | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |  |                  |                  |            |        |
|-----------------|--|------------------|------------------|------------|--------|
| ITEM NO<br>0017 | SUPPLIES/SERVICES<br>DETENTION POND<br>SITE WORK | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |  |                  |                  |            |        |
|-----------------|--|------------------|------------------|------------|--------|
| ITEM NO<br>0018 | SUPPLIES/SERVICES<br>DETENTION POND<br>DRAINAGE<br>STRUCTURE | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |   |                  |                  |            |        |
|-----------------|---|------------------|------------------|------------|--------|
| ITEM NO<br>0019 | SUPPLIES/SERVICES<br>DETENTION POND<br>RIPRAP AND<br>CONCRETE BLOCK<br>SYSTEM | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|---|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |  |                  |                  |            |        |
|-----------------|--|------------------|------------------|------------|--------|
| ITEM NO<br>0020 | SUPPLIES/SERVICES<br>DETENTION POND<br>SEEDING | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

**PUMP STATION E-1**

|                 |                                |                  |                  |            |        |
|-----------------|--------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0021 | SUPPLIES/SERVICES<br>SITE WORK | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                |                  |                  |            |        |
|-----------------|--------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0022 | SUPPLIES/SERVICES<br>STRUCTURE | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                 |                  |                  |            |        |
|-----------------|---------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0023 | SUPPLIES/SERVICES<br>ELECTRICAL | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|---------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                 |                  |                  |            |        |
|-----------------|---------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0024 | SUPPLIES/SERVICES<br>MECHANICAL | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|---------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |  |                  |                  |            |        |
|-----------------|--|------------------|------------------|------------|--------|
| ITEM NO<br>0025 | SUPPLIES/SERVICES<br>ELECTRICAL<br>SERVICE | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                   |                  |                  |            |        |
|-----------------|-----------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0026 | SUPPLIES/SERVICES<br>SLUICE GATES | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|-----------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |   |                  |                  |            |        |
|-----------------|---|------------------|------------------|------------|--------|
| ITEM NO<br>0027 | SUPPLIES/SERVICES<br>INTERIOR<br>DRAINAGE | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|---|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

**GATED OUTLET F-1**

|                 |                                |                  |                  |            |        |
|-----------------|--------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0028 | SUPPLIES/SERVICES<br>SITE WORK | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                |                  |                  |            |        |
|-----------------|--------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0029 | SUPPLIES/SERVICES<br>STRUCTURE | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                 |                  |                  |            |        |
|-----------------|---------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0030 | SUPPLIES/SERVICES<br>MECHANICAL | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|---------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                   |                  |                  |            |        |
|-----------------|-----------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0031 | SUPPLIES/SERVICES<br>SLUICE GATES | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|-----------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|



| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0032    | INTERIOR DRAINAGE | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

**BELMONT COULEE (SUNBEAM) RESTROOM**

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0033    | SITE WORK         | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0034    | STRUCTURE         | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0035    | ELECTRICAL        | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0036    | MECHANICAL        | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES  | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--------------------|----------|----------|------------|--------|
| 0037    | ELECTRICAL SERVICE | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0038    | SANITARY SEWER    | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0039    | WATER SERVICE     | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

**CLOSURE STRUCTURES**

| ITEM NO | SUPPLIES/SERVICES             | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------------------|----------|----------|------------|--------|
| 0040    | 2ND AVE NORTH<br>(PEDESTRIAN) | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0041    | ELKS DRIVE        | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES             | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---------|-------------------------------|----------|------|------------|--------|
| 0042    | SIGNAGE ON<br>CLOSURE COLUMNS | 2        | Each |            |        |

\_\_\_\_\_.

**LEVEE-STATION 151+90 TO 181 + 28**

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0043    | DEMOLITION        | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES |
|---------|-------------------|
| 0044    | LEVEE REMOVAL     |

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT          | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|---------------|------------|--------|
| 0044AA  | FIRST 4500 CY     | 4,500.00 | Cubic<br>Yard |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT          | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|---------------|------------|--------|
| 0044AB  | OVER 4500 CY      | 525.00   | Cubic<br>Yard |            |        |

\_\_\_\_\_.

|                 |   |                  |                  |            |        |
|-----------------|---|------------------|------------------|------------|--------|
| ITEM NO<br>0045 | SUPPLIES/SERVICES<br>CLEARING AND<br>GRUBBING | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|---|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                |                  |                  |            |        |
|-----------------|--------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0046 | SUPPLIES/SERVICES<br>STRIPPING | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |   |
|-----------------|---|
| ITEM NO<br>0047 | SUPPLIES/SERVICES<br>INSPECTION<br>TRENCH |
|-----------------|---|

|                   |                                     |                    |                        |            |        |
|-------------------|-------------------------------------|--------------------|------------------------|------------|--------|
| ITEM NO<br>0047AA | SUPPLIES/SERVICES<br>REGULAR TRENCH | QUANTITY<br>302.00 | UNIT<br>Linear<br>Foot | UNIT PRICE | AMOUNT |
|-------------------|-------------------------------------|--------------------|------------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                   |  |                    |                        |            |        |
|-------------------|--|--------------------|------------------------|------------|--------|
| ITEM NO<br>0047AB | SUPPLIES/SERVICES<br>TRENCH IN VICINITY<br>OF REMOVED<br>BUILDINGS | QUANTITY<br>430.00 | UNIT<br>Linear<br>Foot | UNIT PRICE | AMOUNT |
|-------------------|--|--------------------|------------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |  |
|-----------------|--|
| ITEM NO<br>0048 | SUPPLIES/SERVICES<br>SELECT IMPERVIOUS<br>FILL |
|-----------------|--|

|                   |                                    |                      |                       |            |        |
|-------------------|------------------------------------|----------------------|-----------------------|------------|--------|
| ITEM NO<br>0048AA | SUPPLIES/SERVICES<br>FIRST 1050 CY | QUANTITY<br>1,050.00 | UNIT<br>Cubic<br>Yard | UNIT PRICE | AMOUNT |
|-------------------|------------------------------------|----------------------|-----------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                   |                                   |                    |                       |            |        |
|-------------------|-----------------------------------|--------------------|-----------------------|------------|--------|
| ITEM NO<br>0048AB | SUPPLIES/SERVICES<br>OVER 1050 CY | QUANTITY<br>200.00 | UNIT<br>Cubic<br>Yard | UNIT PRICE | AMOUNT |
|-------------------|-----------------------------------|--------------------|-----------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

ITEM NO 0049 SUPPLIES/SERVICES  
IMPERVIOUS FILL

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|------------|------------|--------|
| 0049AA  | FIRST 6,650 CY    | 6,650.00 | Cubic Yard |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|------------|------------|--------|
| 0049AB  | OVER 6,650 CY     | 1,150.00 | Cubic Yard |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0050    | FLOODWALL         | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES                     | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|---------------------------------------|----------|----------|------------|--------|
| 0051    | CONCRETE PLANTER WALLS AND MEDALLIONS | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES               | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|---------------------------------|----------|----------|------------|--------|
| 0052    | SEGMENTAL BLOCK RETAINING WALLS | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES      | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|------------------------|----------|----------|------------|--------|
| 0053    | 3RD STREET INTERCEPTOR | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES         | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|---------------------------|----------|----------|------------|--------|
| 0054    | 3RD STREET SANITARY SEWER | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

|                 |  |                  |                  |            |        |
|-----------------|--|------------------|------------------|------------|--------|
| ITEM NO<br>0055 | SUPPLIES/SERVICES<br>3RD STREET<br>RECONSTRUCTION                  | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |  |                  |                  | _____.     | _____. |
| ITEM NO<br>0056 | SUPPLIES/SERVICES<br>PARKING LOTS                                  | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |  |                  |                  | _____.     | _____. |
| ITEM NO<br>0057 | SUPPLIES/SERVICES<br>CONCRETE PAVING                               | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |  |                  |                  | _____.     | _____. |
| ITEM NO<br>0058 | SUPPLIES/SERVICES<br>BITUMINOUS<br>PAVING                          | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |  |                  |                  | _____.     | _____. |
| ITEM NO<br>0059 | SUPPLIES/SERVICES<br>CONCRETE STAIR,<br>HANDRAIL AND<br>CHEEK WALL | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |  |                  |                  | _____.     | _____. |
| ITEM NO<br>0060 | SUPPLIES/SERVICES<br>LIGHTING/<br>ELECTRICAL                       | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |  |                  |                  | _____.     | _____. |
| ITEM NO<br>0061 | SUPPLIES/SERVICES<br>TYPE "A" TRASH<br>CAN                         | QUANTITY<br>5.00 | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                 |  |                  |                  | _____.     | _____. |

|                 |   |                  |                  |            |        |
|-----------------|---|------------------|------------------|------------|--------|
| ITEM NO<br>0062 | SUPPLIES/SERVICES<br>REMOVE AND<br>RELOCATE<br>BOLLARD &<br>SIGNAGE | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0063 | SUPPLIES/SERVICES<br>REGULATORY<br>SIGNAGE                          | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0064 | SUPPLIES/SERVICES<br>SPLIT RAIL FENCE                               | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0065 | SUPPLIES/SERVICES<br>TYPE "B" BOLLARDS                              | QUANTITY<br>3.00 | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0066 | SUPPLIES/SERVICES<br>CROSSWALK<br>STRIPING                          | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0067 | SUPPLIES/SERVICES<br>TYPE "B" BENCH                                 | QUANTITY<br>8.00 | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0068 | SUPPLIES/SERVICES<br>TYPE "C" BENCH                                 | QUANTITY<br>4.00 | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0069 | SUPPLIES/SERVICES<br>TRANSPLANTED<br>TREES                          | QUANTITY<br>1.00 | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |

| ITEM NO | SUPPLIES/SERVICES                | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|----------------------------------|----------|----------|------------|--------|
| 0070    | TREES, SHRUBS,<br>AND PERENNIALS | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES                          | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--|----------|----------|------------|--------|
| 0071    | TOPSOIL AND CLASS I SEEDING (TURF GRASSES) | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES                             | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|---|----------|----------|------------|--------|
| 0072    | TOPSOIL AND CLASS II SEEDING (NATIVE GRASSES) | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES                    | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--------------------------------------|----------|----------|------------|--------|
| 0073    | TOPSOIL AND CLASS II SEEDING W/FORBS | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES  | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--|----------|----------|------------|--------|
| 0074    | TOPSOIL & CLASS III SEEDING<br>- (MOIST CONDITION GRASSES) | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

**LEVEE - STATION 224+50 TO 237+03**

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0075    | DEMOLITION        | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

|         |                   |
|---------|-------------------|
| ITEM NO | SUPPLIES/SERVICES |
| 0076    | LEVEE REMOVAL     |

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT          | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|---------------|------------|--------|
| 0076AA  | FIRST 9950 CY     | 9,950.00 | Cubic<br>Yard |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

|                   |                                   |                      |                       |            |        |
|-------------------|-----------------------------------|----------------------|-----------------------|------------|--------|
| ITEM NO<br>0076AB | SUPPLIES/SERVICES<br>OVER 9950 CY | QUANTITY<br>1,750.00 | UNIT<br>Cubic<br>Yard | UNIT PRICE | AMOUNT |
|-------------------|-----------------------------------|----------------------|-----------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |   |                  |                  |            |        |
|-----------------|---|------------------|------------------|------------|--------|
| ITEM NO<br>0077 | SUPPLIES/SERVICES<br>CLEARING AND<br>GRUBBING | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|---|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                |                  |                  |            |        |
|-----------------|--------------------------------|------------------|------------------|------------|--------|
| ITEM NO<br>0078 | SUPPLIES/SERVICES<br>STRIPPING | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|-----------------|--------------------------------|------------------|------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |  |  |  |  |  |
|-----------------|--|--|--|--|--|
| ITEM NO<br>0079 | SUPPLIES/SERVICES<br>BANK STABILIZATION, R20 RIP RAP |  |  |  |  |
|-----------------|--|--|--|--|--|

|                   |                                       |                       |                        |            |        |
|-------------------|---------------------------------------|-----------------------|------------------------|------------|--------|
| ITEM NO<br>0079AA | SUPPLIES/SERVICES<br>FIRST 29,000 TON | QUANTITY<br>29,000.00 | UNIT<br>Actual<br>Tons | UNIT PRICE | AMOUNT |
|-------------------|---------------------------------------|-----------------------|------------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                   |                                      |                      |                        |            |        |
|-------------------|--------------------------------------|----------------------|------------------------|------------|--------|
| ITEM NO<br>0079AB | SUPPLIES/SERVICES<br>OVER 29,000 TON | QUANTITY<br>5,500.00 | UNIT<br>Actual<br>Tons | UNIT PRICE | AMOUNT |
|-------------------|--------------------------------------|----------------------|------------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |   |  |  |  |  |
|-----------------|---|--|--|--|--|
| ITEM NO<br>0080 | SUPPLIES/SERVICES<br>INSPECTION<br>TRENCH |  |  |  |  |
|-----------------|---|--|--|--|--|

|                   |                                     |                    |                        |            |        |
|-------------------|-------------------------------------|--------------------|------------------------|------------|--------|
| ITEM NO<br>0080AA | SUPPLIES/SERVICES<br>REGULAR TRENCH | QUANTITY<br>160.00 | UNIT<br>Linear<br>Foot | UNIT PRICE | AMOUNT |
|-------------------|-------------------------------------|--------------------|------------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|



| ITEM NO | SUPPLIES/SERVICES                       | QUANTITY | UNIT        | UNIT PRICE | AMOUNT |
|---------|---|----------|-------------|------------|--------|
| 0080AB  | TRENCH IN VICINITY OF REMOVED BUILDINGS | 50.00    | Linear Foot | _____.     | _____. |
| 0081    | SELECT IMPERVIOUS FILL                  |          |             |            |        |
| 0081AA  | FIRST 550 CY                            | 550.00   | Cubic Yard  | _____.     | _____. |
| 0081AB  | OVER 550 CY                             | 100.00   | Cubic Yard  | _____.     | _____. |
| 0082    | IMPERVIOUS FILL                         |          |             |            |        |
| 0082AA  | FIRST 1950 CY                           | 1,950.00 | Cubic Yard  | _____.     | _____. |
| 0082AB  | OVER 1950                               | 350.00   | Cubic Yard  | _____.     | _____. |
| 0083    | CYLINDER PILE WALL                      | 1.00     | Lump Sum    | _____.     | _____. |

|                 |   |                  |                  |                          |                      |
|-----------------|---|------------------|------------------|--------------------------|----------------------|
| ITEM NO<br>0084 | SUPPLIES/SERVICES<br>FLOODWALL  | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0085 | SUPPLIES/SERVICES<br>BITUMINOUS<br>PAVING                               | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0086 | SUPPLIES/SERVICES<br>REMOVE AND RELOCATE BOLLARDS & SIGNAGE             | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0087 | SUPPLIES/SERVICES<br>TYPE "B" BENCH                                     | QUANTITY<br>2.00 | UNIT<br>Each     | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0088 | SUPPLIES/SERVICES<br>REGULATORY<br>SIGNAGE                              | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0089 | SUPPLIES/SERVICES<br>TOPSOIL AND CLASS I SEEDING (TURF GRASSES)         | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0090 | SUPPLIES/SERVICES<br>TOPSOIL AND CLASS II SEEDING<br>- (NATIVE GRASSES) | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0091 | SUPPLIES/SERVICES<br>TOPSOIL AND CLASS II SEEDING W/FORBS               | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |

| ITEM NO | SUPPLIES/SERVICES  | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--|----------|----------|------------|--------|
| 0092    | TOPSOIL & CLASS III SEEDING<br>- (MOIST CONDITION GRASSES) | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

**LEVEE-STATION 254+96 TO 304+44**

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0093    | DEMOLITION        | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

|         |                   |
|---------|-------------------|
| ITEM NO | SUPPLIES/SERVICES |
| 0094    | LEVEE REMOVAL     |

| ITEM NO | SUPPLIES/SERVICES | QUANTITY  | UNIT          | UNIT PRICE | AMOUNT |
|---------|-------------------|-----------|---------------|------------|--------|
| 0094AA  | FIRST 21,000 CY   | 21,000.00 | Cubic<br>Yard |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT          | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|---------------|------------|--------|
| 0094AB  | OVER 21,000 CY    | 3,600.00 | Cubic<br>Yard |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES     | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-----------------------|----------|----------|------------|--------|
| 0095    | CLEARING AND GRUBBING | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0096    | STRIPPING         | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

|         |                      |
|---------|----------------------|
| ITEM NO | SUPPLIES/SERVICES    |
| 0097    | INSPECTION<br>TRENCH |

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT           | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------------|------------|--------|
| 0097AA  | REGULAR TRENCH    | 4,674.00 | Linear<br>Foot |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES                       | QUANTITY | UNIT           | UNIT PRICE | AMOUNT |
|---------|---|----------|----------------|------------|--------|
| 0097AB  | TRENCH IN VICINITY OF REMOVED BUILDINGS | 208.00   | Linear<br>Foot |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES         |
|---------|---------------------------|
| 0098    | SELECT IMPERVIOUS<br>FILL |

| ITEM NO | SUPPLIES/SERVICES | QUANTITY  | UNIT          | UNIT PRICE | AMOUNT |
|---------|-------------------|-----------|---------------|------------|--------|
| 0098AA  | FIRST 13,900 CY   | 13,900.00 | Cubic<br>Yard |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT          | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|---------------|------------|--------|
| 0098AB  | OVER 13,900 CY    | 2,450.00 | Cubic<br>Yard |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES |
|---------|-------------------|
| 0099    | IMPERVIOUS FILL   |

| ITEM NO | SUPPLIES/SERVICES | QUANTITY   | UNIT          | UNIT PRICE | AMOUNT |
|---------|-------------------|------------|---------------|------------|--------|
| 0099AA  | FIRST 155,100 CY  | 155,100.00 | Cubic<br>Yard |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY  | UNIT          | UNIT PRICE | AMOUNT |
|---------|-------------------|-----------|---------------|------------|--------|
| 0099AB  | OVER 155,100 CY   | 27,400.00 | Cubic<br>Yard |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

ITEM NO SUPPLIES/SERVICES  
0100 RANDOM FILL

| ITEM NO | SUPPLIES/SERVICES | QUANTITY  | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|-----------|------------|------------|--------|
| 0100AA  | FIRST 23,700 CY   | 23,700.00 | Cubic Yard |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|------------|------------|--------|
| 0100AB  | OVER 23,700 CY    | 4,200.00 | Cubic Yard |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0101    | FLOODWALL         | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES               | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|---------------------------------|----------|----------|------------|--------|
| 0102    | SEGMENTAL BLOCK RETAINING WALLS | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0103    | CONCRETE PAVING   | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0104    | BITUMINOUS PAVING | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES       | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------------|----------|----------|------------|--------|
| 0105    | LIGHTING/<br>ELECTRICAL | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

|                 |   |                   |                  |                          |                      |
|-----------------|---|-------------------|------------------|--------------------------|----------------------|
| ITEM NO<br>0106 | SUPPLIES/SERVICES<br>TYPE "C" BOLLARD       | QUANTITY<br>16.00 | UNIT<br>Each     | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0107 | SUPPLIES/SERVICES<br>TYPE "B" BOLLARD       | QUANTITY<br>6.00  | UNIT<br>Each     | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0108 | SUPPLIES/SERVICES<br>CROSSWALK<br>STRIPPING | QUANTITY<br>1.00  | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0109 | SUPPLIES/SERVICES<br>TYPE "B" BENCH         | QUANTITY<br>5.00  | UNIT<br>Each     | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0110 | SUPPLIES/SERVICES<br>TYPE "C" BENCH         | QUANTITY<br>2.00  | UNIT<br>Each     | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0111 | SUPPLIES/SERVICES<br>TYPE "A" TRASH<br>CAN  | QUANTITY<br>5.00  | UNIT<br>Each     | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0112 | SUPPLIES/SERVICES<br>REGULATORY<br>SIGNAGE  | QUANTITY<br>1.00  | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0113 | SUPPLIES/SERVICES<br>SPLIT RAIL FENCE       | QUANTITY<br>1.00  | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |

| ITEM NO | SUPPLIES/SERVICES  | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---------|--------------------|----------|------|------------|--------|
| 0114    | TRANSPLANTED TREES | 1.00     | Each |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES           | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-----------------------------|----------|----------|------------|--------|
| 0115    | TREES, SHRUBS, & PERENNIALS | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES                          | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--|----------|----------|------------|--------|
| 0116    | TOPSOIL AND CLASS I SEEDING (TURF GRASSES) | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES                             | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|---|----------|----------|------------|--------|
| 0117    | TOPSOIL AND CLASS II SEEDING (NATIVE GRASSES) | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES                    | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--------------------------------------|----------|----------|------------|--------|
| 0118    | TOPSOIL AND CLASS II SEEDING W/FORBS | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES  | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--|----------|----------|------------|--------|
| 0119    | TOP SOIL AND CLASS III SEEDING - (MOIST CONDITION GRASSES) | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

**LEEVE - STATION 355+00 TO 409+90**

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0120    | DEMOLITION        | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES |
|---------|-------------------|
| 0121    | LEEVE REMOVAL     |

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|------------|------------|--------|
| 0121AA  | FIRST 5,300 CY    | 5,300.00 | Cubic Yard |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|------------|------------|--------|
| 0121AB  | OVER 5,300 CY     | 5,300.00 | Cubic Yard |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES     | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-----------------------|----------|----------|------------|--------|
| 0122    | CLEARING AND GRUBBING | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0123    | STRIPPING         | 1.00     | Lump Sum |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES              |
|---------|--------------------------------|
| 0124    | BANK STABILIZATION, R20 RIPRAP |

| ITEM NO | SUPPLIES/SERVICES | QUANTITY  | UNIT        | UNIT PRICE | AMOUNT |
|---------|-------------------|-----------|-------------|------------|--------|
| 0124AA  | FIRST 28,000 TONS | 28,000.00 | Actual Tons |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT        | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|-------------|------------|--------|
| 0124AB  | OVER 28,000 TONS  | 5,000.00 | Actual Tons |            |        |

|  |  |  |  |        |        |
|--|--|--|--|--------|--------|
|  |  |  |  | _____. | _____. |
|--|--|--|--|--------|--------|

| ITEM NO | SUPPLIES/SERVICES |
|---------|-------------------|
| 0125    | INSPECTION TRENCH |



|                   |                                     |                      |                        |            |        |
|-------------------|-------------------------------------|----------------------|------------------------|------------|--------|
| ITEM NO<br>0125AA | SUPPLIES/SERVICES<br>REGULAR TRENCH | QUANTITY<br>3,245.00 | UNIT<br>Linear<br>Foot | UNIT PRICE | AMOUNT |
|-------------------|-------------------------------------|----------------------|------------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                   |  |                    |                        |            |        |
|-------------------|--|--------------------|------------------------|------------|--------|
| ITEM NO<br>0125AB | SUPPLIES/SERVICES<br>TRENCH IN VICINITY OF REMOVED BUILDINGS | QUANTITY<br>716.00 | UNIT<br>Linear<br>Foot | UNIT PRICE | AMOUNT |
|-------------------|--|--------------------|------------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |  |
|-----------------|--|
| ITEM NO<br>0126 | SUPPLIES/SERVICES<br>SELECT IMPERVIOUS<br>FILL |
|-----------------|--|

|                   |                                     |                      |                       |            |        |
|-------------------|-------------------------------------|----------------------|-----------------------|------------|--------|
| ITEM NO<br>0126AA | SUPPLIES/SERVICES<br>FIRST 9,775 CY | QUANTITY<br>9,775.00 | UNIT<br>Cubic<br>Yard | UNIT PRICE | AMOUNT |
|-------------------|-------------------------------------|----------------------|-----------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                   |                                    |                      |                       |            |        |
|-------------------|------------------------------------|----------------------|-----------------------|------------|--------|
| ITEM NO<br>0126AB | SUPPLIES/SERVICES<br>OVER 9,775 CY | QUANTITY<br>1,725.00 | UNIT<br>Cubic<br>Yard | UNIT PRICE | AMOUNT |
|-------------------|------------------------------------|----------------------|-----------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                 |                                      |
|-----------------|--------------------------------------|
| ITEM NO<br>0127 | SUPPLIES/SERVICES<br>IMPERVIOUS FILL |
|-----------------|--------------------------------------|

|                   |                                       |                        |                       |            |        |
|-------------------|---------------------------------------|------------------------|-----------------------|------------|--------|
| ITEM NO<br>0127AA | SUPPLIES/SERVICES<br>FIRST 138,700 CY | QUANTITY<br>138,700.00 | UNIT<br>Cubic<br>Yard | UNIT PRICE | AMOUNT |
|-------------------|---------------------------------------|------------------------|-----------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

|                   |                                      |                       |                       |            |        |
|-------------------|--------------------------------------|-----------------------|-----------------------|------------|--------|
| ITEM NO<br>0127AB | SUPPLIES/SERVICES<br>OVER 138,700 CY | QUANTITY<br>24,500.00 | UNIT<br>Cubic<br>Yard | UNIT PRICE | AMOUNT |
|-------------------|--------------------------------------|-----------------------|-----------------------|------------|--------|

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

ITEM NO SUPPLIES/SERVICES  
0128 RANDOM FILL

| ITEM NO | SUPPLIES/SERVICES | QUANTITY  | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|-----------|------------|------------|--------|
| 0128AA  | FIRST 52,900 CY   | 52,900.00 | Cubic Yard |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|------------|------------|--------|
| 0128AB  | OVER 52,900 CY    | 9,300.00 | Cubic Yard |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0129    | FLOODWALL         | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

ITEM NO SUPPLIES/SERVICES  
0130 SLOPE UNLOADING

| ITEM NO | SUPPLIES/SERVICES | QUANTITY  | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|-----------|------------|------------|--------|
| 0130AA  | FIRST 38,000 CY   | 38,000.00 | Cubic Yard |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT       | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|------------|------------|--------|
| 0130AB  | OVER 38,000 CY    | 6,800.00 | Cubic Yard |            |        |

\_\_\_\_\_.

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0131    | CONCRETE PAVING   | 1.00     | Lump Sum |            |        |

\_\_\_\_\_.

|                 |   |                  |                  |            |        |
|-----------------|---|------------------|------------------|------------|--------|
| ITEM NO<br>0132 | SUPPLIES/SERVICES<br>BITUMINOUS<br>PAVING                       | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0133 | SUPPLIES/SERVICES<br>TYPE "A" TRASH<br>CAN                      | QUANTITY<br>2.00 | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0134 | SUPPLIES/SERVICES<br>TYPE "B" BENCH                             | QUANTITY<br>5.00 | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0135 | SUPPLIES/SERVICES<br>REMOVE AND RELOCATE BOLLARDS & SIGNAGE     | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0136 | SUPPLIES/SERVICES<br>REGULATORY SIGNAGE                         | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0137 | SUPPLIES/SERVICES<br>DIRECTIONAL SIGNAGE                        | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0138 | SUPPLIES/SERVICES<br>CHAIN LINK FENCE                           | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0139 | SUPPLIES/SERVICES<br>TREES, SHRUBS & PERENNIALS                 | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |
| ITEM NO<br>0140 | SUPPLIES/SERVICES<br>TOPSOIL AND CLASS I SEEDING (TURF GRASSES) | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                 |   |                  |                  | _____.     | _____. |

| ITEM NO | SUPPLIES/SERVICES                             | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|---|----------|----------|------------|--------|
| 0141    |   | 1.00     | Lump Sum |            |        |
|         | TOPSOIL AND CLASS II SEEDING (NATIVE GRASSES) |          |          |            |        |

|       |       |
|-------|-------|
| _____ | _____ |
|-------|-------|

| ITEM NO | SUPPLIES/SERVICES                    | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--------------------------------------|----------|----------|------------|--------|
| 0142    |                                      | 1.00     | Lump Sum |            |        |
|         | TOPSOIL AND CLASS II SEEDING W/FORBS |          |          |            |        |

|       |       |
|-------|-------|
| _____ | _____ |
|-------|-------|

| ITEM NO | SUPPLIES/SERVICES  | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--|----------|----------|------------|--------|
| 0143    |  | 1.00     | Lump Sum |            |        |
|         | TOPSOIL AND CLASS III SEEDING<br>(MOIST CONDITION GRASSES) |          |          |            |        |

|       |       |
|-------|-------|
| _____ | _____ |
|-------|-------|

**BELMONT COULEE (SUNBEAM) RESTROOM**

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0144    | DEMOLITION        | 1.00     | Lump Sum |            |        |

|       |       |
|-------|-------|
| _____ | _____ |
|-------|-------|

| ITEM NO | SUPPLIES/SERVICES     | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-----------------------|----------|----------|------------|--------|
| 0145    |                       | 1.00     | Lump Sum |            |        |
|         | CLEARING AND GRUBBING |          |          |            |        |

|       |       |
|-------|-------|
| _____ | _____ |
|-------|-------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0146    | GRADING           | 1.00     | Lump Sum |            |        |

|       |       |
|-------|-------|
| _____ | _____ |
|-------|-------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0147    | PARKING LOT       | 1.00     | Lump Sum |            |        |

|       |       |
|-------|-------|
| _____ | _____ |
|-------|-------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|------|------------|--------|
| 0148    | TYPE "C" BOLLARD  | 5.00     | Each |            |        |

|       |       |
|-------|-------|
| _____ | _____ |
|-------|-------|

|                 |  |                  |                  |                          |                      |
|-----------------|--|------------------|------------------|--------------------------|----------------------|
| ITEM NO<br>0149 | SUPPLIES/SERVICES<br>TYPE "B" BENCH          | QUANTITY<br>2.00 | UNIT<br>Each     | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0150 | SUPPLIES/SERVICES<br>TYPE "A" TRASH<br>CAN   | QUANTITY<br>1.00 | UNIT<br>Each     | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0151 | SUPPLIES/SERVICES<br>DIRECTIONAL<br>SIGNAGE  | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0152 | SUPPLIES/SERVICES<br>REGULATORY<br>SIGNAGE   | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0153 | SUPPLIES/SERVICES<br>SPLIT RAIL FENCE        | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0154 | SUPPLIES/SERVICES<br>LIGHTING/<br>ELECTRICAL | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0155 | SUPPLIES/SERVICES<br>CONCRETE PAVING         | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0156 | SUPPLIES/SERVICES<br>ENTRY SIGN              | QUANTITY<br>1.00 | UNIT<br>Lump Sum | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |

|                 |   |                    |              |                          |                      |
|-----------------|---|--------------------|--------------|--------------------------|----------------------|
| ITEM NO<br>0157 | SUPPLIES/SERVICES<br>2.5" FALL GOLD ASH         | QUANTITY<br>5.00   | UNIT<br>Each | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0158 | SUPPLIES/SERVICES<br>24" GOLDMOUND<br>SPIREA    | QUANTITY<br>12.00  | UNIT<br>Each | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0159 | SUPPLIES/SERVICES<br>24" MISS KIM LILAC         | QUANTITY<br>9.00   | UNIT<br>Each | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0160 | SUPPLIES/SERVICES<br>1 GAL. BLACK EYED<br>SUSAN | QUANTITY<br>300.00 | UNIT<br>Each | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0161 | SUPPLIES/SERVICES<br>30" SPREAD TAUTON<br>YEW   | QUANTITY<br>7.00   | UNIT<br>Each | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0162 | SUPPLIES/SERVICES<br>1 GAL. TIGER LILY          | QUANTITY<br>150.00 | UNIT<br>Each | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0163 | SUPPLIES/SERVICES<br>1 GAL. PRAIRIE<br>PHLOX    | QUANTITY<br>125.00 | UNIT<br>Each | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |
| ITEM NO<br>0164 | SUPPLIES/SERVICES<br>1 GAL. BLUE FLAG           | QUANTITY<br>75.00  | UNIT<br>Each | UNIT PRICE<br><br>_____. | AMOUNT<br><br>_____. |

|                                 |   |                    |                  |            |        |
|---------------------------------|---|--------------------|------------------|------------|--------|
| ITEM NO<br>0165                 | SUPPLIES/SERVICES<br>1 GAL. ASTER<br>PURPLE DOME                | QUANTITY<br>350.00 | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                                 |   |                    |                  | _____.     | _____. |
| ITEM NO<br>0166                 | SUPPLIES/SERVICES<br>24" RED OSIER<br>DOGWOOD                   | QUANTITY<br>25.00  | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                                 |   |                    |                  | _____.     | _____. |
| ITEM NO<br>0167                 | SUPPLIES/SERVICES<br>24" NEARLY WIDE<br>ROSE                    | QUANTITY<br>36.00  | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                                 |   |                    |                  | _____.     | _____. |
| ITEM NO<br>0168                 | SUPPLIES/SERVICES<br>24" DAKOTA GOLDRUSH POTENTILLA             | QUANTITY<br>36.00  | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                                 |   |                    |                  | _____.     | _____. |
| ITEM NO<br>0169                 | SUPPLIES/SERVICES<br>24" COMPACT AMERICAN CRANBERRY             | QUANTITY<br>13.00  | UNIT<br>Each     | UNIT PRICE | AMOUNT |
|                                 |   |                    |                  | _____.     | _____. |
| ITEM NO<br>0170                 | SUPPLIES/SERVICES<br>TREES, SHRUBS & PERENNIALS                 | QUANTITY<br>1.00   | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                                 |   |                    |                  | _____.     | _____. |
| ITEM NO<br>0171                 | SUPPLIES/SERVICES<br>TOPSOIL AND CLASS I SEEDING (TURF GRASSES) | QUANTITY<br>1.00   | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                                 |   |                    |                  | _____.     | _____. |
| <b>LINCOLN PARK GOLF COURSE</b> |   |                    |                  |            |        |
| ITEM NO<br>0172                 | SUPPLIES/SERVICES<br>DEMOLITION                                 | QUANTITY<br>1.00   | UNIT<br>Lump Sum | UNIT PRICE | AMOUNT |
|                                 |   |                    |                  | _____.     | _____. |

| ITEM NO | SUPPLIES/SERVICES     | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-----------------------|----------|----------|------------|--------|
| 0173    | CLEARING AND GRUBBING | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|-------------------|----------|----------|------------|--------|
| 0174    | GRADING           | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

| ITEM NO | SUPPLIES/SERVICES                          | QUANTITY | UNIT     | UNIT PRICE | AMOUNT |
|---------|--|----------|----------|------------|--------|
| 0175    | TOPSOIL AND CLASS I SEEDING (TURF GRASSES) | 1.00     | Lump Sum |            |        |

|        |        |
|--------|--------|
| _____. | _____. |
|--------|--------|

TOTAL \$ \_\_\_\_\_



## BID SCHEDULE NOTES

1. EFFECTIVE MAY 31, 1998, ALL CONTRACTORS MUST REGISTER WITH THE DEFENSE CENTRAL CONTRACTOR REGISTRATION (CCR) IN ORDER TO RECEIVE ANY CONTRACT AWARD. (other than those made via the Government credit card program). Contractors may register on line at <http://www.ccr.gov>. See Clause 252.204-7004 in Section 00700.

2. FACSIMILE OF BIDS/PROPOSALS AND FACSIMILE OF MODIFICATIONS THERETO, WILL NOT BE ACCEPTED.

3. All Quantities are estimated except where unit is given as "EA" (EACH) or "LS" (LUMP SUM).

4. NOTICE TO LARGE BUSINESS: The U.S. Army Corps of Engineers, St. Paul District, is committed to participation of Small Business, Small Disadvantaged Business and Women-Owned Small Business in the performance of work under this solicitation and resultant contract.

Your attention is directed to the solicitation clauses 52.219-0008 entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns", 52.219-0009 I entitled "Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan," and 252.219-7003 entitled "Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DOD Contracts)".

If you are a large business and the apparent low bidder with a bid exceeding \$1,000,000, submission of a Subcontracting Plan in accordance with above clauses will be required. The Contracting Officer will review the plan using the following goals to assure that it represents your best efforts to maximize subcontracting opportunities. Award will not be made until the Contracting Officer approves the Subcontracting Plan.

The following subcontracting goals are informational only and not legally binding but are considered reasonable and achievable during the resultant contract from this solicitation. The goals expressed in percent of total planned subcontracting dollars are:

|   |                        |
|---|------------------------|
| Small                                   | 61.4%                  |
| Small Disadvantaged Business            | 9.1%                   |
| Women-Owned Small Business              | 5.0%                   |
| HUBZone Small Business                  | Maximum (%)Practicable |
| Veteran-owned Small Business            | 3.0%                   |
| Subcontract Reporting (SF 294 & SF 295) | 100.0%                 |

5. The apparent low bidder will be requested to provide the following information as soon as possible after bid opening:

- a. A Financial Statement, to include a balance sheet and income statement, and
- b. A Bank Certification of Financial Capability (line of credit).

This information will be treated as confidential. The financial statements should be not over 60 days old. If over 60 days old, a certification should be attached stating that the financial condition of the firm is substantially the same or, if not the same, the changes that have taken place.

6. All extensions of the unit prices shown will be subject to verification by the Government. In case of a discrepancy between the unit price and the extension, the unit price will govern.

7. The original bid/proposal and any modifications must be complete as to all the items on the schedule. Award will be made to that bidder whose bid is most advantageous to the Government, based on price and the price related factors included in the solicitation.

8. Unbalanced Bids. The government may reject as nonresponsive any bid that is materially unbalanced between contract line item numbers or sub-items on the bidding schedule. A bid is materially unbalanced when it is based on prices that are significantly less than cost for some work and prices that are overstated, in relation to cost, for other work. A materially unbalanced bid may be rejected if the Contracting Officer has a reasonable doubt as to whether the bid will result in the lowest overall cost to the government even though it may be the low evaluated bid. Additionally, a bid that is so unbalanced so as to be tantamount to an advance payment will be rejected as nonresponsive even if acceptance of the bid would result in the lowest overall cost to the government.

9. Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing in accordance with Section 00100, Contract Clause "Explanation To Prospective Bidders", not later than 10 days prior to bid opening. Questions can be faxed to the contract specialist at (651) 290-5706. Questions received after the deadline may not be answered prior to bid submittal.

10. Funding for this contract is contingent upon the conditions stated in Section 00800, Clause No. 52.232-5001, Continuing Contracts.

11. The addresses, phone numbers, and Internet address (if available) for references cited in these specifications are listed in the Corps of Engineer Guide Specification (CEGS) 01090 SOURCES FOR REFERENCE PUBLICATIONS. CEGS 01090 is available on the TECHNIFO page of the Corps of Engineers Huntsville District Internet site at: <http://w2.hnd.usace.army.mil/>.

12. Any forthcoming amendments will only be available on this web site. E-mail notifications will be sent upon issuance of any amendments to all registered firms. E-mail message notifications may not be reliable based on system constraints. It is therefore recommended that each registered firm check this web site periodically for updates. A paper hard copy of each amendment will not be mailed unless specifically requested in writing.

### 13. Bid Bonds

a. It is the responsibility of the bidder to include an acceptable bid guarantee with its bid. This bid note does not provide bidders with an all-inclusive checklist for submitting an acceptable bid bond – rather, it provides some “lessons learned” information as to the unacceptability of photocopied bid bonds.

b. This solicitation requires bidders to submit a bid guarantee along with their bids (see clause 52.228-1). One acceptable form of bid guarantee is a bid bond. For a bid to be responsive, the bid bond accompanying the bid must unequivocally bind the bonding company – if it does not, the bid must be rejected as nonresponsive. Please note that a nonresponsive bid may not be corrected after bid opening to make it responsive – it must be rejected. The Contracting Officer has the authority and responsibility to determine whether the bid bond and its accompanying documentation clearly show that the person(s) executing the bid bond on behalf of the surety have the authority to unequivocally bind the bonding company. In order for a bid bond to be acceptable, it must be accompanied by a valid power-of-attorney issued by the surety (the bonding company, not the insurance agency writing the bond).

c. Photocopied or faxed powers-of-attorney are not acceptable. In order for a power-of-attorney accompanying a bid bond to be acceptable, it must be: (i) an original power-of-attorney (containing original signatures and corporate seals), (ii) a copy of a power-of-attorney accompanied by an original certification (original means original signature and original corporate seal) by the secretary (or other authorized officer) of the surety stating that the copied power-of-attorney is still in full force and effect as of the date of the certification and has not been revoked, or (iii) a power-of-attorney with facsimile (stamped, printed or mechanically signed) signatures and facsimile corporate seals that: (A) contains language stating that the surety will be bound by facsimile seals and signatures and (B) also contains an ORIGINAL corporate seal at the certification block. (An original seal is (I) a raised, crimped seal, or (II) a paper or foil corporate seal that is manually attached to the power-of-attorney.)

14. For purposes of the clause entitled “52.219-4 -- Notice of Price Evaluation Preference for HUBZone Small Business Concerns (Jan 1999)”, the term “otherwise successful offer” means the lowest responsive bid from a responsible bidder prior to the application of any evaluation preference required by this clause.

The solicitation clause FAR 52.219-4 expressed that Small Disadvantaged Business (SDB) firms would receive both the HUBZone and SDB evaluation preference adjustments (See FAR clause 52.219-23). Guidance from the Office of the Under Secretary of Defense provides that DOD contracting activities, including the Department of the Army, shall suspend the use of price evaluation adjustments for SDB businesses in DOD Acquisitions, as prescribed in FAR subpart 19.11.

Therefore the clause 52.219-23 is not contained in this solicitation and no SDB evaluation preference adjustment will be utilized.

**SECTION 00100 Bidding Schedule/Instructions to Bidders**

## CLAUSES INCORPORATED BY FULL TEXT

**52.204-6 DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (JUN 99)**

(a) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation "DUNS" followed by the DUNS number that identifies the offeror's name and address exactly as stated in the offer.

(b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:

- (1) Company name.
- (2) Company address.
- (3) Company telephone number.
- (4) Line of business.
- (5) Chief executive officer/key manager.
- (6) Date the company was started.
- (7) Number of people employed by the company.
- (8) Company affiliation.

(c) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet Home Page at <http://www.customerservice@dnb.com>. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at [globalinfo@mail.dnb.com](mailto:globalinfo@mail.dnb.com).

(End of provision)

**52.209-4001 BIDDER'S QUALIFICATIONS (APR 1984) FAR 9.105-1**

Before a bid is considered for award, the bidder may be requested by the Government to submit a statement regarding his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the work.

**52.214-1 SOLICITATION DEFINITIONS--SEALED BIDDING (JUL 1987)**

"Government" means United States Government.

"Offer" means "bid" in sealed bidding.

"Solicitation" means an invitation for bids in sealed bidding.

(End of provision)

**52.214-3 AMENDMENTS TO INVITATIONS FOR BIDS (DEC 1989)**

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date in the space provided for this purpose on the form for submitting a bid, (3) by letter or telegram, or (4) by facsimile, if facsimile bids are authorized in the solicitation. The Government must receive the acknowledgment by the time and at the place specified for receipt of bids.

(End of provision)

**52.214-4 FALSE STATEMENTS IN BIDS (APR 1984)**

Bidders must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

(End of provision)

**52.214-5 SUBMISSION OF BIDS (MAR 1997)**

(a) Bids and bid modifications shall be submitted in sealed envelopes or packages (unless submitted by electronic means) (1) addressed to the office specified in the solicitation, and (2) showing the time and date specified for receipt, the solicitation number, and the name and address of the bidder.

(b) Bidders using commercial carrier services shall ensure that the bid is addressed and marked on the outermost envelope or wrapper as prescribed in subparagraphs (a)(1) and (2) of this provision when delivered to the office specified in the solicitation.

(c) Telegraphic bids will not be considered unless authorized by the solicitation; however, bids may be modified or withdrawn by written or telegraphic notice.

(d) Facsimile bids, modifications, or withdrawals, will not be considered unless authorized by the solicitation.

(e) Bids submitted by electronic commerce shall be considered only if the electronic commerce method was specifically stipulated or permitted by the solicitation.

**52.214-6 EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984)**

Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing soon enough to allow a reply to reach all prospective bidders before the submission of their bids. Oral explanations or instructions given before the award of a contract will not be binding. Any information given a prospective bidder concerning a solicitation will be furnished promptly to all other prospective bidders as an amendment to the solicitation, if that information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective bidders.

(End of provision)

**52.214-7 LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS (NOV 1999)**

(a) Bidders are responsible for submitting bids, and any modifications or withdrawals, so as to reach the Government office designated in the invitation for bids (IFB) by the time specified in the IFB. If no time is specified in the IFB, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that bids are due.

(b)(1) Any bid, modification, or withdrawal received at the Government office designated in the IFB after the exact time specified for receipt of bids is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late bid would not unduly delay the acquisition; and--

(i) If it was transmitted through an electronic commerce method authorized by the IFB, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of bids; or

(ii) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of bids and was under the Government's control prior to the time set for receipt of bids.

(2) However, a late modification of an otherwise successful bid that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(c) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the bid wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(d) If an emergency or unanticipated event interrupts normal Government processes so that bids cannot be received at the Government office designated for receipt of bids by the exact time specified in the IFB and urgent Government requirements preclude amendment of the IFB, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(e) Bids may be withdrawn by written notice received at any time before the exact time set for receipt of bids. If the IFB authorizes facsimile bids, bids may be withdrawn via facsimile received at any time before the exact time set for receipt of bids, subject to the conditions specified in the provision at 52.214-31, Facsimile Bids. A bid may be

withdrawn in person by a bidder or its authorized representative if, before the exact time set for receipt of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

(End of provision)

**52.214-18 PREPARATION OF BIDS--CONSTRUCTION (APR 1984)**

- (a) Bids must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a bid must initial each erasure or change appearing on any bid form.
- (b) The bid form may require bidders to submit bid prices for one or more items on various bases, including--
  - (1) Lump sum bidding;
  - (2) Alternate prices;
  - (3) Units of construction; or
  - (4) Any combination of subparagraphs (1) through (3) above.
- (c) If the solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "no bid" in the space provided for any item on which no price is submitted.
- (d) Alternate bids will not be considered unless this solicitation authorizes their submission.

**52.214-19 CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION (AUG 1996)**

- (a) The Government will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the Government, considering only price and the price-related factors specified elsewhere in the solicitation.
- (b) The Government may reject any or all bids, and waive informalities or minor irregularities in bids received.
- (c) The Government may accept any item or combination of items, unless doing so is precluded by a restrictive limitation in the solicitation or the bid.
- (d) The Government may reject a bid as nonresponsive if the prices bid are materially unbalanced between line items or subline items. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the Government even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advance payment.

**52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991)**

Offers submitted in response to this solicitation shall be in the English language. Offers received in other than English shall be rejected.

(End of provision)

**52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991)**

Offers submitted in response to this solicitation shall be in terms of U.S. dollars. Offers received in other than U.S. dollars shall be rejected.

(End of provision)

**52.214-4001 INQUIRIES - BID INFORMATION**

(a) Inquiries:

Any questions regarding this solicitation should be directed to Tammy Moore, Contract Specialist, at telephone number (651) 290-5408 (collect calls not accepted). It is requested that all technical questions on the plans and specifications be submitted to the Contract Specialist by facsimile transmission to (651) 290-5706.

The Planholder's List and bid results can be found on the St. Paul District web site at <http://www.mvp.usace.army.mil> (click on "Contracting/Bidders Info", then "Electronic Bid Solicitations").

(b) Bid Depository/Bid Opening Information:

Bids must be deposited prior to the date and time set for opening of bids. The bid depository is located in the Contracting Division, 6<sup>th</sup> Floor, of the St. Paul District, Corps of Engineers Centre, 190 Fifth Street East, St. Paul, Minnesota 55101-1638. A public bid opening will be held at the same location.

**52.214-4002 ALL OR NONE QUALIFICATIONS (APR 1984) FAR 14.404-5**

A bidder/offeror must quote on all items in this solicitation to be eligible for award. The Government will award on a "All or None" basis. Evaluation of bids/offers will be based, among other factors, upon the total price quoted for all items.

**52.225-13 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (JUL 2000)**

(a) The Contractor shall not acquire, for use in the performance of this contract, any supplies or services originating from sources within, or that were located in or transported from or through, countries whose products are banned from importation into the United States under regulations of the Office of Foreign Assets Control, Department of the



Treasury. Those countries are Cuba, Iran, Iraq, Libya, North Korea, Sudan, the territory of Afghanistan controlled by the Taliban, and Serbia (excluding the territory of Kosovo).

(b) The Contractor shall not acquire for use in the performance of this contract any supplies or services from entities controlled by the government of Iraq.

(c) The Contractor shall insert this clause, including this paragraph (c), in all subcontracts.

(End of clause)

#### **52.233-2 SERVICE OF PROTEST (AUG 1996)**

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from

Department of the Army  
Contracting Division  
St. Paul District, Corps of Engineers  
190 Fifth Street E  
St. Paul, MN 55101-1638

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

(End of provision)

#### **52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995)**

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors or quoters are urged and expected to inspect the site where the work will be performed.

(b) Site visits may be arranged during normal duty hours by contacting:

Name: Craig Johnson  
Address: U.S. Army Corps of Engineers  
Western Area Office  
201 North 3<sup>rd</sup> Street  
Grand Forks, North Dakota 58203  
Telephone: 701-722-8292

#### **52.236-4002 WORK PERFORMED BY THE CONTRACTOR**

The successful bidder must furnish the Contracting Officer within 10 days after the award, the items of work which he will perform with his own forces, the percentage of the total work this represents, and the estimated cost thereof. (See Section 00700, clause entitled ("Performance of Work by the Contractor, FAR 52.236-1").

**52.236-4005      *UNAVAILABILITY OF UTILITY SERVICES***

The responsibility shall be upon the Contractor to provide and maintain at its expense, adequate utilities for its use for construction and domestic consumption, and to install and maintain necessary connections and lines for same, but only at such locations and in such manner as may be approved by the Contracting Officer. Before final acceptance, temporary connections and lines installed by the Contractor shall be removed in a manner satisfactory to the Contracting Officer.

**52.252-1      *SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)***

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at this/these address(es):

[www.arnet.gov](http://www.arnet.gov)

**SECTION 00600 Representations & Certifications**

## CLAUSES INCORPORATED BY FULL TEXT

**52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985)**

(a) The offeror certifies that --

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to --

(i) Those prices,

(ii) The intention to submit an offer, or

(iii) The methods of factors used to calculate the prices offered:

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory --

(1) Is the person in the offeror's organization responsible for determining the prices offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision \_\_\_\_\_ (insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision.

(c) If the offeror deletes or modifies subparagraph (a)(2) of this provision, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of provision)

**52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (APR 1991)**

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this Certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,--

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, Title 31, United States Code. Any person who makes an expenditure prohibited under this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

(End of provision)

**52.204-3 TAXPAYER IDENTIFICATION (OCT 1998)**

(a) Definitions.

“Common parent,” as used in this provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

“Taxpayer Identification Number (TIN),” as used in this provision, means the number required by the Internal Revenue Service (IRS) to be used by the offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

(b) All offerors must submit the information required in paragraphs (d) through (f) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the IRS. If the resulting contract is subject to the payment reporting requirements described in Federal Acquisition Regulation (FAR) 4.904, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(d) Taxpayer Identification Number (TIN).

\_\_\_ TIN: \_\_\_\_\_

\_\_\_ TIN has been applied for.

\_\_\_ TIN is not required because:

\_\_\_ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

\_\_\_ Offeror is an agency or instrumentality of a foreign government;

\_\_\_ Offeror is an agency or instrumentality of the Federal Government.

(e) Type of organization.

\_\_\_ Sole proprietorship;

\_\_\_ Partnership;

\_\_\_ Corporate entity (not tax-exempt);

\_\_\_ Corporate entity (tax-exempt);

\_\_\_ Government entity (Federal, State, or local);

\_\_\_ Foreign government;

\_\_\_ International organization per 26 CFR 1.6049-4;

\_\_\_ Other \_\_\_\_\_

(f) Common parent.

\_\_\_ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.

\_\_\_ Name and TIN of common parent:

Name \_\_\_\_\_

TIN \_\_\_\_\_

(End of provision)

**52.204-5 WOMEN-OWNED BUSINESS (OTHER THAN SMALL BUSINESS) (MAY 1999)**

(a) Definition. Women-owned business concern, as used in this provision, means a concern that is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of its stock is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

(b) Representation. [Complete only if the offeror is a women-owned business concern and has not represented itself as a small business concern in paragraph (b)(1) of FAR 52.219-1, Small Business Program Representations, of this solicitation.] The offeror represents that it ( ) is a women-owned business concern.

(End of provision)

**52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (DEC 2001)**

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that--

(i) The Offeror and/or any of its Principals--

(A) Are ( ) are not ( ) presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have ( ) have not ( ), within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property;

(C) Are ( ) are not ( ) presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has ( ) has not ( ), within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a

determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsive.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of provision)

**52.219-1 SMALL BUSINESS PROGRAM REPRESENTATIONS (MAY 2001) ALTERNATE I (OCT 2000)**

(a)(1) The North American Industry Classification System (NAICS) code for this acquisition is **234990**.

(2) The small business size standard is **\$27.5 million**.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) Representations. (1) The offeror represents as part of its offer that it ( ) is, ( ) is not a small business concern.

(2) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents, for general statistical purposes, that it ( ) is, ( ) is not a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a women-owned small business concern.

(4) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a veteran-owned small business concern.

(5) (Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(4) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a service-disabled veteran-owned small business concern.

(6) (Complete only if offeror represented itself as small business concern in paragraph (b)(1) of this provision). The offeror represents, as part of its offer, that--

(i) It ( ) is, ( ) is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR Part 126; and

(ii) It ( ) is, ( ) is not a joint venture that complies with the requirements of 13 CFR Part 126, and the representation in paragraph (b)(6)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. (The offeror shall enter the name or names of the HUBZone small business

concern or concerns that are participating in the joint venture: \_\_\_\_\_.) Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(c) Definitions. As used in this provision--

Service-disabled veteran-owned small business concern--

(1) Means a small business concern--

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

Small business concern means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

Veteran-owned small business concern means a small business concern--

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

Women-owned small business concern means a small business concern --

(1) That is at least 51 percent owned by one or more women; in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) Notice.

(1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, HUBZone small, small disadvantaged, or women-owned small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall--

(i) Be punished by imposition of fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.



(End of provision)

**52.219-2 EQUAL LOW BIDS. (OCT 1995)**

(a) This provision applies to small business concerns only.

(b) The bidder's status as a labor surplus area (LSA) concern may affect entitlement to award in case of tie bids. If the bidder wishes to be considered for this priority, the bidder must identify, in the following space, the LSA in which the costs to be incurred on account of manufacturing or production (by the bidder or the first-tier subcontractors) amount to more than 50 percent of the contract price.

---

(c) Failure to identify the labor surplus area as specified in paragraph (b) of this provision will preclude the bidder from receiving priority consideration. If the bidder is awarded a contract as a result of receiving priority consideration under this provision and would not have otherwise received award, the bidder shall perform the contract or cause the contract to be performed in accordance with the obligations of an LSA concern.

**52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM (OCT 2000)**

(a) Definition.

"Emerging small business" as used in this solicitation, means a small business concern whose size is no greater than 50 percent of the numerical size standard applicable to the North American Industry Classification System (NAICS) code assigned to a contracting opportunity.

(b) [Complete only if the Offeror has represented itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.] The Offeror [ ] is, [ ] is not an emerging small business.

(c) (Complete only if the Offeror is a small business or an emerging small business, indicating its size range.)

Offeror's number of employees for the past 12 months (check this column if size standard stated in solicitation is expressed in terms of number of employees) or Offeror's average annual gross revenue for the last 3 fiscal years (check this column if size standard stated in solicitation is expressed in terms of annual receipts). (Check one of the following.)

No. of Employees    Avg. Annual Gross Revenues

\_\_\_\_ 50 or fewer    \_\_\_\_ \$1 million or less

\_\_\_\_ 51 - 100    \_\_\_\_ \$1,000,001 - \$2 million

\_\_\_\_ 101 - 250    \_\_\_\_ \$2,000,001 - \$3.5 million

\_\_\_\_ 251 - 500    \_\_\_\_ \$3,500,001 - \$5 million

☐ 501 - 750      ☐ \$5,000,001 - \$10 million  
☐ 751 - 1,000      ☐ \$10,000,001 - \$17 million  
☐ Over 1,000      ☐ Over \$17 million

(End of provision)

**52.222-22    *PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (FEB 1999)***

The offeror represents that --

- (a) ☐ It has, ☐ has not participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation;
- (b) ☐ It has, ☐ has not, filed all required compliance reports; and
- (c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End of provision)

**52.223-13    *CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 2000)***

(a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995.

(b) By signing this offer, the offeror certifies that--

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: (Check each block that is applicable.)

☐ (i) The facility does not manufacture, process or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

☐ (ii) The facility does not have 10 or more full-time employees as specified in section 313.(b)(1)(A) of EPCRA 42 U.S.C. 11023(b)(1)(A);

☐ (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

[ ] (iv) The facility does not fall within Standard Industrial Classification Code (SIC) major groups 20 through 39 or their corresponding North American Industry Classification System (NAICS) sectors 31 through 33; or

[ ] (v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

**52.225-11 BUY AMERICAN ACT--BALANCE OF PAYMENTS PROGRAM--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (DEC 2001)**

(a) Definitions. As used in this clause--

Component means an article, material, or supply incorporated directly into a construction material.

Construction material means an article, material, or supply brought to the construction site by the Contractor or subcontractor for incorporation into the building or work. The term also includes an item brought to the site preassembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of those systems are delivered to the construction site. Materials purchased directly by the Government are supplies, not construction material.

Cost of components means--

(1) For components purchased by the Contractor, the acquisition cost, including transportation costs to the place of incorporation into the end product (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or

(2) For components manufactured by the Contractor, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the end product.

Designated country means any of the following countries: Aruba, Austria, Bangladesh, Belgium, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Canada, Cape Verde, Central African Republic, Chad, Comoros, Denmark, Djibouti, Equatorial Guinea, Finland, France, Gambia, Germany, Greece, Guinea, Guinea-Bissau, Haiti, Hong Kong, Iceland, Ireland, Israel, Italy, Japan.

Kiribati, Korea, Republic of, Lesotho, Liechtenstein, Luxembourg, Malawi, Maldives, Mali, Mozambique, Nepal, Netherlands, Niger, Norway, Portugal, Rwanda.

Sao Tome and Principe, Sierra Leone, Singapore, Somalia, Spain, Sweden, Switzerland, Tanzania U.R., Togo, Tuvalu, Uganda, United Kingdom, Vanuatu, Western Samoa, Yemen.

Designated country construction material means a construction material that--

(1) Is wholly the growth, product, or manufacture of a designated country; or

(2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

Domestic construction material means--

- (1) An unmanufactured construction material mined or produced in the United States; or
- (2) A construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind for which nonavailability determinations have been made are treated as domestic.

Foreign construction material means a construction material other than a domestic construction material.

North American Free Trade Agreement country means Canada or Mexico.

North American Free Trade Agreement country construction material means a construction material that--

- (1) Is wholly the growth, product, or manufacture of a North American Free Trade Agreement (NAFTA) country; or
- (2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

United States means the 50 States and the District of Columbia, U.S. territories and possessions, Puerto Rico, the Northern Mariana Islands, and any other place subject to U.S. jurisdiction, but does not include leased bases.

(b) Construction materials. (1) This clause implements the Buy American Act (41 U.S.C. 10a-10d) and the Balance of Payments Program by providing a preference for domestic construction material. In addition, the Contracting Officer has determined that the Trade Agreements Act and the North American Free Trade Agreement (NAFTA) apply to this acquisition. Therefore, the Buy American Act and Balance of Payments Program restrictions are waived for designated country and NAFTA country construction materials.

(2) The Contractor shall use only domestic, designated country, or NAFTA country construction material in performing this contract, except as provided in paragraphs (b)(3) and (b)(4) of this clause.

(3) The requirement in paragraph (b)(2) of this clause does not apply to the construction materials or components listed by the Government as follows: (Contracting Officer to list applicable excepted materials or indicate "none")

(4) The Contracting Officer may add other foreign construction material to the list in paragraph (b)(3) of this clause if the Government determines that--

- (i) The cost of domestic construction material would be unreasonable. The cost of a particular domestic construction material subject to the restrictions of the Buy American Act is unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent. For determination of unreasonable cost under the Balance of Payments Program, the Contracting Officer will use a factor of 50 percent;
- (ii) The application of the restriction of the Buy American Act or Balance of Payments Program to a particular construction material would be impracticable or inconsistent with the public interest; or
- (iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(c) Request for determination of inapplicability of the Buy American Act or Balance of Payments Program. (1)(i) Any Contractor request to use foreign construction material in accordance with paragraph (b)(4) of this clause shall include adequate information for Government evaluation of the request, including--

(A) A description of the foreign and domestic construction materials;

(B) Unit of measure;

- (C) Quantity;
- (D) Price;
- (E) Time of delivery or availability;
- (F) Location of the construction project;
- (G) Name and address of the proposed supplier; and
- (H) A detailed justification of the reason for use of foreign construction materials cited in accordance with paragraph (b)(3) of this clause.
- (ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause.
- (iii) The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).
- (iv) Any Contractor request for a determination submitted after contract award shall explain why the Contractor could not reasonably foresee the need for such determination and could not have requested the determination before contract award. If the Contractor does not submit a satisfactory explanation, the Contracting Officer need not make a determination.
- (2) If the Government determines after contract award that an exception to the Buy American Act or Balance of Payments Program applies and the Contracting Officer and the Contractor negotiate adequate consideration, the Contracting Officer will modify the contract to allow use of the foreign construction material. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration is not less than the differential established in paragraph (b)(4)(i) of this clause.
- (3) Unless the Government determines that an exception to the Buy American Act or Balance of Payments Program applies, use of foreign construction material is noncompliant with the Buy American Act or Balance of Payments Program.
- (d) Data. To permit evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the Contractor shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Construction Materials Price Comparison

| Construction material description  | Unit of measure | Quantity | Price (dollars) \1\ |
|------------------------------------|-----------------|----------|---------------------|
| Item 1:                            |                 |          |                     |
| Foreign construction material....  |                 |          |                     |
| Domestic construction material.... |                 |          |                     |
| Item 2:                            |                 |          |                     |
| Foreign construction material....  |                 |          |                     |
| Domestic construction material.... |                 |          |                     |

\1\ Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

List name, address, telephone number, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

(End of clause)

**52.232-38 SUBMISSION OF ELECTRONIC FUNDS TRANSFER INFORMATION WITH OFFER (MAY 1999)**

The offeror shall provide, with its offer, the following information that is required to make payment by electronic funds transfer (EFT) under any contract that results from this solicitation. This submission satisfies the requirement to provide EFT information under paragraphs (b)(1) and (j) of the clause at 52.232-34, Payment by Electronic Funds Transfer--Other than Central Contractor Registration.

- (1) The solicitation number (or other procurement identification number).
- (2) The offeror's name and remittance address, as stated in the offer.
- (3) The signature (manual or electronic, as appropriate), title, and telephone number of the offeror's official authorized to provide this information.
- (4) The name, address, and 9-digit Routing Transit Number of the offeror's financial agent.
- (5) The offeror's account number and the type of account (checking, savings, or lockbox).
- (6) If applicable, the Fedwire Transfer System telegraphic abbreviation of the offeror's financial agent.
- (7) If applicable, the offeror shall also provide the name, address, telegraphic abbreviation, and 9-digit Routing Transit Number of the correspondent financial institution receiving the wire transfer payment if the offeror's financial agent is not directly on-line to the Fedwire and, therefore, not the receiver of the wire transfer payment.

(End of provision)

**252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)**

- (a) "Definitions."

As used in this provision --

- (a) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.
- (2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405(j)(i)(A)), to be a country the government of which has repeatedly provided support for such acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.
- (3) "Significant interest" means --
  - (i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest

includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) "Prohibition on award."

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) "Disclosure."

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include --

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

(End of provision)

#### **252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)**

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term supplies is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation. The Offeror represents that it:

\_\_\_\_ (1) Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

\_\_\_\_ (2) Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

(End of provision)

**SECTION 00700 Contract Clauses**

## CLAUSES INCORPORATED BY FULL TEXT

**52.202-1 DEFINITIONS (DEC 2001) --ALTERNATE I (MAY 2001)**

(a) Agency head or head of the agency means the Secretary (Attorney General, Administrator, Governor, Chairperson, or other chief official, as appropriate) of the agency, unless otherwise indicated, including any deputy or assistant chief official of the executive agency.

(b) "Commercial component" means any component that is a commercial item.

(c) Any item, other than real property, that is of a type customarily used by the general public or by non-governmental entities for purposes other than governmental purposes, and that--

(i) Has been sold, leased, or licensed to the general public; or

(ii) Has been offered for sale, lease, or license to the general public;

(2) Any item that evolved from an item described in paragraph (c)(1) of this clause through advances in technology or performance and that is not yet available in the commercial marketplace, but will be available in the commercial marketplace in time to satisfy the delivery requirements under a Government solicitation;

(3) Any item that would satisfy a criterion expressed in paragraphs (c)(1) or (c)(2) of this clause, but for--

(i) Modifications of a type customarily available in the commercial marketplace; or

(ii) Minor modifications of a type not customarily available in the commercial marketplace made to meet Federal Government requirements. "Minor" modifications means modifications that do not significantly alter the nongovernmental function or essential physical characteristics of an item or component, or change the purpose of a process. Factors to be considered in determining whether a modification is minor include the value and size of the modification and the comparative value and size of the final product. Dollar values and percentages may be used as guideposts, but are not conclusive evidence that a modification is minor;

(4) Any combination of items meeting the requirements of paragraphs (c)(1), (2), (3), or (5) of this clause that are of a type customarily combined and sold in combination to the general public;

(5) Installation services, maintenance services, repair services, training services, and other services if--

(i) Such services are procured for support of an item referred to in paragraph (c)(1), (2), (3), or (4) of this definition, regardless of whether such services are provided by the same source or at the same time as the item; and

(ii) The source of such services provides similar services contemporaneously to the general public under terms and conditions similar to those offered to the Federal Government;

(6) Services of a type offered and sold competitively in substantial quantities in the commercial marketplace based on established catalog or market prices for specific tasks performed under standard commercial terms and conditions. This does not include services that are sold based on hourly rates without an established catalog or market price for a specific service performed. For purposes of these services--



(i) Catalog price means a price included in a catalog, price list, schedule, or other form that is regularly maintained by the manufacturer or vendor, is either published or otherwise available for inspection by customers, and states prices at which sales are currently, or were last, made to a significant number of buyers constituting the general public; and

(ii) Market prices means current prices that are established in the course of ordinary trade between buyers and sellers free to bargain and that can be substantiated through competition or from sources independent of the offerors.

(7) Any item, combination of items, or service referred to in subparagraphs (c)(1) through (c)(6), notwithstanding the fact that the item, combination of items, or service is transferred between or among separate divisions, subsidiaries, or affiliates of a Contractor; or

(8) A nondevelopmental item, if the procuring agency determines the item was developed exclusively at private expense and sold in substantial quantities, on a competitive basis, to multiple State and local Governments.

(d) Component means any item supplied to the Government as part of an end item or of another component, except that for use in 52.225-9, and 52.225-11 see the definitions in 52.225-9(a) and 52.225-11(a).

(e) Contracting Officer means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(f) Nondevelopmental item means--

(1) Any previously developed item of supply used exclusively for governmental purposes by a Federal agency, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement;

(2) Any item described in paragraph (f)(1) of this definition that requires only minor modification or modifications of a type customarily available in the commercial marketplace in order to meet the requirements of the procuring department or agency; or

(3) Any item of supply being produced that does not meet the requirements of paragraph (f)(1) or (f)(2) solely because the item is not yet in use.

(End of clause)

#### **52.202-4001      *DEFINITIONS (MAY 1995) EFARS Part 2.101***

"Chief of Contracting Office" means the Chief of the Contracting Division at a District, or the Director of Contracting at a Division, Center, Laboratory, or other support activity.

"Command" means each USACE Division, each USACE District, The U.S. Army Engineering and Support Center (HNC), Transatlantic Programs Center (TAC), Transatlantic Programs Center (Europe) (TAE), Topographic Engineer Center (TEC), Cold Regions Research and Engineering Laboratory (CRREL), Construction Engineering Research Laboratory (CERL), Humphreys Engineering Center Support Activity (HECSA), and Waterways experiment Station (WES).

"Commander" means the commanding officer of each USACE district and each USACE division, and the director or commander of HNC, TAC, TAE, ETL, CRREL, CERL, HECSA and WES.

"Head of Contracting Activity (HCA)" for USACE means the Chief of Engineers.

Centers. For determining contracting authority levels for this regulation, Centers (HNC, and TAC) will equate to a Division. As a subordinate unit to TAC, TAE's contracting authority will therefore equate to that of a district.

Level higher than the contracting officer. When a District or TAE chief of contracting is the contracting officer, a "level higher than the contracting officer" means the Division or Center Director of Contracting. When an operating Division, Center or Laboratory Director/Chief of Contracting is the contracting officer a "level higher than the contracting officer" means the PARC.

Local Cooperation Agreements (LCAs). See Project Cooperation Agreements.

Project Cooperation Agreements. Formerly referred to as Local Cooperation Agreements, these are agreements under 31 U.S.C. 6305 and 42 U.S.C. 1962d-5b. They are not contracts as defined by the FAR.

"USACE and HQUSACE" means the United States Army Corps of Engineers and its headquarters, respectively.

#### **52.203-3 GRATUITIES (APR 1984)**

(a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative--

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and

(2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If this contract is terminated under paragraph (a) of this clause, the Government is entitled--

(1) To pursue the same remedies as in a breach of the contract; and

(2) In addition to any other damages provided by law, to exemplary damages of not less than 3 nor more than 10 times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee. (This subparagraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

#### **52.203-5 COVENANT AGAINST CONTINGENT FEES (APR 1984)**

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent

fee.

(b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

(End of clause)

#### **52.203-7 ANTI-KICKBACK PROCEDURES. (JUL 1995)**

(a) Definitions.

"Kickback," as used in this clause, means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided, directly or indirectly, to any prime Contractor, prime Contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a subcontract relating to a prime contract.

"Person," as used in this clause, means a corporation, partnership, business association of any kind, trust, joint-stock company, or individual.

"Prime contract," as used in this clause, means a contract or contractual action entered into by the United States for the purpose of obtaining supplies, materials, equipment, or services of any kind.

"Prime Contractor," as used in this clause, means a person who has entered into a prime contract with the United States.

"Prime Contractor employee," as used in this clause, means any officer, partner, employee, or agent of a prime Contractor.

"Subcontract," as used in this clause, means a contract or contractual action entered into by a prime Contractor or subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind under a prime contract.

"Subcontractor," as used in this clause, (1) means any person, other than the prime Contractor, who offers to furnish or furnishes any supplies, materials, equipment, or services of any kind under a prime contract or a subcontract entered into in connection with such prime contract, and (2) includes any person who offers to furnish or furnishes general supplies to the prime Contractor or a higher tier subcontractor.

"Subcontractor employee," as used in this clause, means any officer, partner, employee, or agent of a subcontractor.

(b) The Anti-Kickback Act of 1986 (41 U.S.C. 51-58) (the Act), prohibits any person from -

(1) Providing or attempting to provide or offering to provide any kickback;

(2) Soliciting, accepting, or attempting to accept any kickback; or

(3) Including, directly or indirectly, the amount of any kickback in the contract price charged by a prime Contractor to the United States or in the contract price charged by a subcontractor to a prime Contractor or higher tier subcontractor.

(c)(1) The Contractor shall have in place and follow reasonable procedures designed to prevent and detect possible violations described in paragraph (b) of this clause in its own operations and direct business relationships.

(2) When the Contractor has reasonable grounds to believe that a violation described in paragraph (b) of this clause may have occurred, the Contractor shall promptly report in writing the possible violation. Such reports shall be made to the inspector general of the contracting agency, the head of the contracting agency if the agency does not have an inspector general, or the Department of Justice.

(3) The Contractor shall cooperate fully with any Federal agency investigating a possible violation described in paragraph (b) of this clause.

(4) The Contracting Officer may (i) offset the amount of the kickback against any monies owed by the United States under the prime contract and/or (ii) direct that the Prime Contractor withhold, from sums owed a subcontractor under the prime contract, the amount of any kickback. The Contracting Officer may order the monies withheld under subdivision (c)(4)(ii) of this clause be paid over to the Government unless the Government has already offset those monies under subdivision (c)(4)(i) of this clause. In either case, the Prime Contractor shall notify the Contracting Officer when the monies are withheld.

(5) The Contractor agrees to incorporate the substance of this clause, including this subparagraph (c)(5) but excepting subparagraph (c)(1), in all subcontracts under this contract which exceed \$100,000.

(End of clause)

**52.203-8 CANCELLATION, RESCISSION, AND RECOVERY OF FUNDS FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)**

(a) If the Government receives information that a contractor or a person has engaged in conduct constituting a violation of subsection (a), (b), (c), or (d) of Section 27 of the Office of Federal Procurement Policy Act (41 U.S.C. 423) (the Act), as amended by section 4304 of the 1996 National Defense Authorization Act for Fiscal Year 1996 (Pub. L. 104-106), the Government may--

(1) Cancel the solicitation, if the contract has not yet been awarded or issued; or

(2) Rescind the contract with respect to which--

(i) The Contractor or someone acting for the Contractor has been convicted for an offense where the conduct constitutes a violation of subsection 27(a) or (b) of the Act for the purpose of either--

(A) Exchanging the information covered by such subsections for anything of value; or

(B) Obtaining or giving anyone a competitive advantage in the award of a Federal agency procurement contract; or

(ii) The head of the contracting activity has determined, based upon a preponderance of the evidence, that the Contractor or someone acting for the Contractor has engaged in conduct constituting an offense punishable under subsections 27(e)(1) of the Act.

(b) If the Government rescinds the contract under paragraph (a) of this clause, the Government is entitled to recover, in addition to any penalty prescribed by law, the amount expended under the contract.

(c) The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law, regulation, or under this contract.

(End of clause)

**52.203-10 PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)**

(a) The Government, at its election, may reduce the price of a fixed-price type contract and the total cost and fee under a cost-type contract by the amount of profit or fee determined as set forth in paragraph (b) of this clause if the head of the contracting activity or designee determines that there was a violation of subsection 27 (a), (b), or (c) of the Office of Federal Procurement Policy Act, as amended (41 U.S.C. 423), as implemented in section 3.104 of the Federal Acquisition Regulation.

(b) The price or fee reduction referred to in paragraph (a) of this clause shall be--

(1) For cost-plus-fixed-fee contracts, the amount of the fee specified in the contract at the time of award;

(2) For cost-plus-incentive-fee contracts, the target fee specified in the contract at the time of award, notwithstanding any minimum fee or "fee floor" specified in the contract;

(3) For cost-plus-award-fee contracts--

(i) The base fee established in the contract at the time of contract award;

(ii) If no base fee is specified in the contract, 30 percent of the amount of each award fee otherwise payable to the Contractor for each award fee evaluation period or at each award fee determination point.

(4) For fixed-price-incentive contracts, the Government may--

(i) Reduce the contract target price and contract target profit both by an amount equal to the initial target profit specified in the contract at the time of contract award; or

(ii) If an immediate adjustment to the contract target price and contract target profit would have a significant adverse impact on the incentive price revision relationship under the contract, or adversely affect the contract financing provisions, the Contracting Officer may defer such adjustment until establishment of the total final price of the contract. The total final price established in accordance with the incentive price revision provisions of the contract shall be reduced by an amount equal to the initial target profit specified in the contract at the time of contract award and such reduced price shall be the total final contract price.

(5) For firm-fixed-price contracts, by 10 percent of the initial contract price or a profit amount determined by the Contracting Officer from records or documents in existence prior to the date of the contract award.

(c) The Government may, at its election, reduce a prime contractor's price or fee in accordance with the procedures of paragraph (b) of this clause for violations of the Act by its subcontractors by an amount not to exceed the amount

of profit or fee reflected in the subcontract at the time the subcontract was first definitively priced.

(d) In addition to the remedies in paragraphs (a) and (c) of this clause, the Government may terminate this contract for default. The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

**52.203-12 LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JUN 1997)**

(a) Definitions.

"Agency," as used in this clause, means executive agency as defined in 2.101.

"Covered Federal action," as used in this clause, means any of the following Federal actions:

- (1) The awarding of any Federal contract.
- (2) The making of any Federal grant.
- (3) The making of any Federal loan.
- (4) The entering into of any cooperative agreement.
- (5) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

"Indian tribe" and "tribal organization," as used in this clause, have the meaning provided in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) and include Alaskan Natives.

"Influencing or attempting to influence," as used in this clause, means making, with the intent to influence, any communication to or appearance before an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

"Local government," as used in this clause, means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government.

"Officer or employee of an agency," as used in this clause, includes the following individuals who are employed by an agency:

- (1) An individual who is appointed to a position in the Government under Title 5, United States Code, including a position under a temporary appointment.
- (2) A member of the uniformed services, as defined in subsection 101(3), Title 37, United States Code.
- (3) A special Government employee, as defined in section 202, Title 18, United States Code.
- (4) An individual who is a member of a Federal advisory committee, as defined by the Federal Advisory Committee Act, Title 5, United States Code, appendix 2.

"Person," as used in this clause, means an individual, corporation, company, association, authority, firm, partnership, society, State, and local government, regardless of whether such entity is operated for profit, or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Reasonable compensation," as used in this clause, means, with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or employee for work that is not furnished to, not funded by, or not furnished in cooperation with the Federal Government.

"Reasonable payment," as used in this clause, means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

"Recipient," as used in this clause, includes the Contractor and all subcontractors. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Regularly employed," as used in this clause, means, with respect to an officer or employee of a person requesting or receiving a Federal contract, an officer or employee who is employed by such person for at least 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly employed as soon as he or she is employed by such person for 130 working days.

"State," as used in this clause, means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, a territory or possession of the United States, an agency or instrumentality of a State, and multi-State, regional, or interstate entity having governmental duties and powers.

(b) Prohibitions.

(1) Section 1352 of Title 31, United States Code, among other things, prohibits a recipient of a Federal contract, grant, loan, or cooperative agreement from using appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(2) The Act also requires Contractors to furnish a disclosure if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

(3) The prohibitions of the Act do not apply under the following conditions:

(i) Agency and legislative liaison by own employees.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action if the payment is for agency and legislative liaison activities not directly related to a covered Federal action.

(B) For purposes of subdivision (b)(3)(i)(A) of this clause, providing any information specifically requested by an agency or Congress is permitted at any time.

(C) The following agency and legislative liaison activities are permitted at any time where they are not related to a specific solicitation for any covered Federal action:

(1) Discussing with an agency the qualities and characteristics (including individual demonstrations) of the person's products or services, conditions or terms of sale, and service capabilities.

(2) Technical discussions and other activities regarding the application or adaptation of the person's products or services for an agency's use.

(D) The following agency and legislative liaison activities are permitted where they are prior to formal solicitation of any covered Federal action--

(1) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action;

(2) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and

(3) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Pub. L. 95-507, and subsequent amendments.

(E) Only those services expressly authorized by subdivision (b)(3)(i)(A) of this clause are permitted under this clause.

(ii) Professional and technical services.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of--

(1) A payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action, if payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action.

(2) Any reasonable payment to a person, other than an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action. Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.

(B) For purposes of subdivision (b)(3)(ii)(A) of this clause, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provide advice and analysis directly applying their professional or technical expertise and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the



engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(C) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation and any other requirements in the actual award documents.

(D) Only those services expressly authorized by subdivisions (b)(3)(ii)(A)(1) and (2) of this clause are permitted under this clause.

(E) The reporting requirements of FAR 3.803(a) shall not apply with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.

(c) Disclosure.

(1) The Contractor who requests or receives from an agency a Federal contract shall file with that agency a disclosure form, OMB standard form LLL, Disclosure of Lobbying Activities, if such person has made or has agreed to make any payment using nonappropriated funds (to include profits from any covered Federal action), which would be prohibited under subparagraph (b)(1) of this clause, if paid for with appropriated funds.

(2) The Contractor shall file a disclosure form at the end of each calendar quarter in which there occurs any event that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under subparagraph (c)(1) of this clause. An event that materially affects the accuracy of the information reported includes--

(i) A cumulative increase of \$25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or

(ii) A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or

(iii) A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

(3) The Contractor shall require the submittal of a certification, and if required, a disclosure form by any person who requests or receives any subcontract exceeding \$100,000 under the Federal contract.

(4) All subcontractor disclosure forms (but not certifications) shall be forwarded from tier to tier until received by the prime Contractor. The prime Contractor shall submit all disclosures to the Contracting Officer at the end of the calendar quarter in which the disclosure form is submitted by the subcontractor. Each subcontractor certification shall be retained in the subcontract file of the awarding Contractor.

(d) Agreement. The Contractor agrees not to make any payment prohibited by this clause.

(e) Penalties.

(1) Any person who makes an expenditure prohibited under paragraph (a) of this clause or who fails to file or amend the disclosure form to be filed or amended by paragraph (b) of this clause shall be subject to civil penalties as provided for by 31 U.S.C. 1352. An imposition of a civil penalty does not prevent the Government from seeking any other remedy that may be applicable.

(2) Contractors may rely without liability on the representation made by their subcontractors in the certification and disclosure form.

(f) Cost allowability. Nothing in this clause makes allowable or reasonable any costs which would otherwise be unallowable or unreasonable. Conversely, costs made specifically unallowable by the requirements in this clause will not be made allowable under any other provision.

(End of clause)

**52.204-4 PRINTED OR COPIED DOUBLE-SIDED ON RECYCLED PAPER (AUG 2000)**

(a) Definitions. As used in this clause--

“Postconsumer material” means a material or finished product that has served its intended use and has been discarded for disposal or recovery, having completed its life as a consumer item. Postconsumer material is a part of the broader category of “recovered material.” For paper and paper products, postconsumer material means “postconsumer fiber” defined by the U.S. Environmental Protection Agency (EPA) as--

(1) Paper, paperboard, and fibrous materials from retail stores, office buildings, homes, and so forth, after they have passed through their end-usage as a consumer item, including: used corrugated boxes; old newspapers; old magazines; mixed waste paper; tabulating cards; and used cordage; or

(2) All paper, paperboard, and fibrous materials that enter and are collected from municipal solid waste; but not

(3) Fiber derived from printers' over-runs, converters' scrap, and over-issue publications.

“Printed or copied double-sided” means printing or reproducing a document so that information is on both sides of a sheet of paper.

“Recovered material,” for paper and paper products, is defined by EPA in its Comprehensive Procurement Guideline as “recovered fiber” and means the following materials:

(1) Postconsumer fiber; and

(2) Manufacturing wastes such as--

(i) Dry paper and paperboard waste generated after completion of the papermaking process (that is, those manufacturing operations up to and including the cutting and trimming of the paper machine reel into smaller rolls or rough sheets) including: envelope cuttings, bindery trimmings, and other paper and paperboard waste resulting from printing, cutting, forming, and other converting operations; bag, box, and carton manufacturing wastes; and butt rolls, mill wrappers, and rejected unused stock; and

(ii) Repulped finished paper and paperboard from obsolete inventories of paper and paperboard manufacturers, merchants, wholesalers, dealers, printers, converters, or others.

(b) In accordance with Section 101 of Executive Order 13101 of September 14, 1998, Greening the Government through Waste Prevention, Recycling, and Federal Acquisition, the Contractor is encouraged to submit paper documents, such as offers, letters, or reports, that are printed or copied double-sided on recycled paper that meet minimum content standards specified in Section 505 of Executive Order 13101, when not using electronic commerce methods to submit information or data to the Government.

(c) If the Contractor cannot purchase high-speed copier paper, offset paper, forms bond, computer printout paper, carbonless paper, file folders, white wove envelopes, writing and office paper, book paper, cotton fiber paper, and cover stock meeting the 30 percent postconsumer material standard for use in submitting paper documents to the Government, it should use paper containing no less than 20 percent postconsumer material. This lesser standard should be used only when paper meeting the 30 percent postconsumer material standard is not obtainable at a reasonable price or does not meet reasonable performance standards.

(End of clause)

**52.209-6 PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (JUL 1995)**

(a) The Government suspends or debar Contractors to protect the Government's interests. The Contractor shall not enter into any subcontract in excess of the \$25,000 with a Contractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

(b) The Contractor shall require each proposed first-tier subcontractor, whose subcontract will exceed \$25,000, to disclose to the Contractor, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principles, is or is not debarred, suspended, or proposed for debarment by the Federal Government.

(c) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is debarred, suspended, or proposed for debarment (see FAR 9.404 for information on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs). The notice must include the following:

(1) The name of the subcontractor.

(2) The Contractor's knowledge of the reasons for the subcontractor being on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

(3) The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

(4) The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

(End of clause)

**52.211-10 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984)**

The Contractor shall be required to (a) commence work under this contract within 10 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than **730 days** after the date the contractor receives the notice to proceed. The time stated for completion shall include final cleanup of the premises.

(End of clause)

**52.211-12 LIQUIDATED DAMAGES--CONSTRUCTION (SEP 2000)**

(a) If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of \$950.00 for each calendar day of delay until the work is completed or accepted.

(b) If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause.

(End of clause)

#### **52.211-13 TIME EXTENSIONS (SEP 2000)**

Time extensions for contract changes will depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The change order granting the time extension may provide that the contract completion date will be extended only for those specific elements related to the changed work and that the remaining contract completion dates for all other portions of the work will not be altered. The change order also may provide an equitable readjustment of liquidated damages under the new completion schedule.

(End of clause)

#### **52.211-18 VARIATION IN ESTIMATED QUANTITY (APR 1984)**

If the quantity of a unit-priced item in this contract is an estimated quantity and the actual quantity of the unit-priced item varies more than 15 percent above or below the estimated quantity, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115 percent or below 85 percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contractor may request, in writing, an extension of time, to be received by the Contracting Officer within 10 days from the beginning of the delay, or within such further period as may be granted by the Contracting Officer before the date of final settlement of the contract. Upon the receipt of a written request for an extension, the Contracting Officer shall ascertain the facts and make an adjustment for extending the completion date as, in the judgement of the Contracting Officer, is justified.

#### **52.214-26 AUDIT AND RECORDS--SEALED BIDDING. (OCT 1997)**

(a) As used in this clause, records includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.

(b) Cost or pricing data. If the Contractor has been required to submit cost or pricing data in connection with the pricing of any modification to this contract, the Contracting Officer, or an authorized representative of the Contracting Officer, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data, shall have the right to examine and audit all of the Contractor's records, including computations and projections, related to--

(1) The proposal for the modification;

(2) The discussions conducted on the proposal(s), including those related to negotiating;

(3) Pricing of the modification; or

(4) Performance of the modification.

(c) Comptroller General. In the case of pricing any modification, the Comptroller General of the United States, or an authorized representative, shall have the same rights as specified in paragraph (b) of this clause.

(d) Availability. The Contractor shall make available at its office at all reasonable times the materials described in reproduction, until 3 years after final payment under this contract, or for any other period specified in Subpart 4.7 of the Federal Acquisition Regulation (FAR). FAR Subpart 4.7, Contractor Records Retention, in effect on the date of this contract, is incorporated by reference in its entirety and made a part of this contract.

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement.

(2) Records pertaining to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to the performance of this contract shall be made available until disposition of such appeals, litigation, or claims.

(e) The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (e), in all subcontracts expected to exceed the threshold in FAR 15.403-4(a)(1) for submission of cost or pricing data.

**52.214-27 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING. (OCT 1997)**

(a) This clause shall become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for the submission of cost or pricing data at FAR 15.403-4(a)(1), except that this clause does not apply to a modification if an exception under FAR 15.403-1(b) applies.

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(b) If any price, including profit, negotiated in connection with any modification under this clause, was increased by any significant amount because

(1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data;

(2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data; or

(3) any of these parties furnished data of any description that were not accurate, the price shall be reduced accordingly and the contract shall be modified to reflect the reduction. This right to a price reduction is limited to that resulting from defects in data relating to modifications for which this clause becomes operative under paragraph (a) above.

(c) Any reduction in the contract price under paragraph (b) above due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which:

(1) the actual subcontract; or

(2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; provided, that the actual subcontract price was not itself affected by defective cost or pricing data.

(d) If the Contracting Officer determines under paragraph (b) of this clause that a price or cost reduction should be made:

(1) the Contractor agrees not to raise the following matters as a defense:

(i) The Contractor or subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the contract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted;

(ii) The Contracting Officer should have known that the cost or pricing data in issue were defective even though the Contractor or subcontractor took no affirmative action to bring the character of the data to the attention of the Contracting Officer;

(iii) The contract was based on an agreement about the total cost of the contract and there was no agreement about the cost of each item procured under the contract; or

(iv) The Contractor or subcontractor did not submit a Certificate of Current Cost or Pricing Data.

(2) Except as prohibited by subdivision (d)(2)(ii) of this clause:

(i) an offset in an amount determined appropriate by the Contracting Officer based upon the facts shall be allowed against the amount of a contract price reduction if:

(A) The Contractor certifies to the Contracting Officer that, to the best of the Contractor's knowledge and belief, the Contractor is entitled to the offset in the amount requested; and

(B) The Contractor proves that the cost or pricing data were available before the date of agreement on the price of the contract (or price of the modification) and that the data were not submitted before such date.

(ii) An offset shall not be allowed if:

(A) The understated data was known by the Contractor to be understated when the Certificate of Current Cost or Pricing Data was signed; or (B) The Government proves that the facts demonstrate that the contract price would not have increased in the amount to be offset even if the available data had been submitted before the date of agreement on price.

(e) If any reduction in the contract price under this clause reduces the price of items for which payment was made prior to the date of the modification reflecting the price reduction, the Contractor shall be liable to and shall pay the United States at the time such overpayment is repaid:

(1) Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Contractor to the date the Government is repaid by the Contractor at the applicable underpayment rate effective for each quarter prescribed by the Secretary of the Treasury under 26 U.S.C. 6621(a)(2); and

(2) A penalty equal to the amount of the overpayment, if the Contractor or subcontractor knowingly submitted cost or pricing data which were incomplete, inaccurate, or noncurrent.

**52.214-28 SUBCONTRACTOR COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING.  
(OCT 1997)**

(a) The requirements of paragraphs (b) and (c) of this clause shall:

(1) become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for submission of cost or pricing data at (FAR) 48 CFR 15.403-4(a)(1); and

(2) be limited to such modifications.

(b) Before awarding any subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), on the date of agreement on price or the date of award, whichever is later; or before pricing any subcontract modifications involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless an exception under FAR 15.403-1(b) applies.

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(c) The Contractor shall require the subcontractor to certify in substantially the form prescribed in subsection 15.406-2 of the Federal Acquisition Regulation that, to the best of its knowledge and belief, the data submitted under paragraph (b) above were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(d) The Contractor shall insert the substance of this clause, including this paragraph (d), in each subcontract that, when entered into, exceeds the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1).

**52.216-1 TYPE OF CONTRACT (APR 1984)**

The Government contemplates award of a firm-fixed price construction contract resulting from this solicitation.

(End of clause)

**52.219-4 NOTICE OF PRICE EVALUATION PREFERENCE FOR HUBZONE SMALL BUSINESS CONCERNS (JAN 1999)**

(a) Definition. HUBZone small business concern, as used in this clause, means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

(b) Evaluation preference. (1) Offers will be evaluated by adding a factor of 10 percent to the price of all offers, except--

(i) Offers from HUBZone small business concerns that have not waived the evaluation preference;

(ii) Otherwise successful offers from small business concerns;

(iii) Otherwise successful offers of eligible products under the Trade Agreements Act when the dollar threshold for application of the Act is exceeded (see 25.402 of the Federal Acquisition Regulation (FAR)); and

(iv) Otherwise successful offers where application of the factor would be inconsistent with a Memorandum of Understanding or other international agreement with a foreign government.

(2) The factor of 10 percent shall be applied on a line item basis or to any group of items on which award may be made. Other evaluation factors described in the solicitation shall be applied before application of the factor.

(3) A concern that is both a HUBZone small business concern and a small disadvantaged business concern will receive the benefit of both the HUBZone small business price evaluation preference and the small disadvantaged business price evaluation adjustment (see FAR clause 52.219-23). Each applicable price evaluation preference or adjustment shall be calculated independently against an offeror's base offer.

These individual preference amounts shall be added together to arrive at the total evaluated price for that offer.

(c) Waiver of evaluation preference. A HUBZone small business concern may elect to waive the evaluation preference, in which case the factor will be added to its offer for evaluation purposes. The agreements in paragraph (d) of this clause do not apply if the offeror has waived the evaluation preference.

\_\_\_ Offeror elects to waive the evaluation preference.

(d) Agreement. A HUBZone small business concern agrees that in the performance of the contract, in the case of a contract for

(1) Services (except construction), at least 50 percent of the cost of personnel for contract performance will be spent for employees of the concern or employees of other HUBZone small business concerns;

(2) Supplies (other than procurement from a nonmanufacturer of such supplies), at least 50 percent of the cost of manufacturing, excluding the cost of materials, will be performed by the concern or other HUBZone small business concerns;

(3) General construction, at least 15 percent of the cost of the contract performance incurred for personnel will be spent on the concern's employees or the employees of other HUBZone small business concerns; or

(4) Construction by special trade contractors, at least 25 percent of the cost of the contract performance incurred for personnel will be spent on the concern's employees or the employees of other HUBZone small business concerns.



(e) A HUBZone joint venture agrees that in the performance of the contract, the applicable percentage specified in paragraph (d) of this clause will be performed by the HUBZone small business participant or participants.

(f) A HUBZone small business concern nonmanufacturer agrees to furnish in performing this contract only end items manufactured or produced by HUBZone small business manufacturer concerns. This paragraph does not apply in connection with construction or service contracts.

(End of clause)

#### **52.219-8 UTILIZATION OF SMALL BUSINESS CONCERNS (OCT 2000)**

(a) It is the policy of the United States that small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, HUBZone small business concerns, small disadvantaged business concerns, and women-owned small business concerns shall have the maximum practicable opportunity to participate in performing contracts let by any Federal agency, including contracts and subcontracts for subsystems, assemblies, components, and related services for major systems. It is further the policy of the United States that its prime contractors establish procedures to ensure the timely payment of amounts due pursuant to the terms of their subcontracts with small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, HUBZone small business concerns, small disadvantaged business concerns, and women-owned small business concerns.

(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with efficient contract performance. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

Definitions. As used in this contract--

HUBZone small business concern means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

Service-disabled veteran-owned small business concern--

(1) Means a small business concern--

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

Small business concern means a small business as defined pursuant to Section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto.

Small disadvantaged business concern means a small business concern that represents, as part of its offer that--

(1) It has received certification as a small disadvantaged business concern consistent with 13 CFR part 124, subpart B;

- (2) No material change in disadvantaged ownership and control has occurred since its certification;
- (3) Where the concern is owned by one or more individuals, the net worth of each individual upon whom the certification is based does not exceed \$750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); and
- (4) It is identified, on the date of its representation, as a certified small disadvantaged business in the database maintained by the Small Business Administration (PRO-Net).

Veteran-owned small business concern means a small business concern--

- (1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and
- (2) The management and daily business operations of which are controlled by one or more veterans.

Women-owned small business concern means a small business concern--

- (1) That is at least 51 percent owned by one or more women, or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and
- (2) Whose management and daily business operations are controlled by one or more women.
- (d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as a small business concern, a veteran-owned small business concern, a service-disabled veteran-owned small business concern, a HUBZone small business concern, a small disadvantaged business concern, or a women-owned small business concern.

(End of clause)

#### **52.219-9 SMALL BUSINESS SUBCONTRACTING PLAN (OCT 2001)**

- (a) This clause does not apply to small business concerns.
- (b) Definitions. As used in this clause--

Commercial item means a product or service that satisfies the definition of commercial item in section 2.101 of the Federal Acquisition Regulation.

Commercial plan means a subcontracting plan (including goals) that covers the offeror's fiscal year and that applies to the entire production of commercial items sold by either the entire company or a portion thereof (e.g., division, plant, or product line).

Individual contract plan means a subcontracting plan that covers the entire contract period (including option periods), applies to a specific contract, and has goals that are based on the offeror's planned subcontracting in support of the specific contract, except that indirect costs incurred for common or joint purposes may be allocated on a prorated basis to the contract.

Master plan means a subcontracting plan that contains all the required elements of an individual contract plan, except goals, and may be incorporated into individual contract plans, provided the master plan has been approved.

Subcontract means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The offeror, upon request by the Contracting Officer, shall submit and negotiate a subcontracting plan, where applicable, that separately addresses subcontracting with small business, veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business concerns, small disadvantaged business, and women-owned small business concerns. If the offeror is submitting an individual contract plan, the plan must separately address subcontracting with small business, veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns, with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be negotiated within the time specified by the Contracting Officer. Failure to submit and negotiate the subcontracting plan shall make the offeror ineligible for award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business, veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns as subcontractors. Service-disabled veteran-owned small business concerns meet the definition of veteran-owned small business concerns, and offerors may include them within the subcontracting plan goal for veteran-owned small business concerns. A separate goal for service-disabled veteran-owned small business concerns is not required. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted for an individual contract plan; or the offeror's total projected sales, expressed in dollars, and the total value of projected subcontracts to support the sales for a commercial plan;

(ii) Total dollars planned to be subcontracted to small business concerns;

(iii) Total dollars planned to be subcontracted to veteran-owned small business concerns;

(iv) Total dollars planned to be subcontracted to HUBZone small business concerns;

(v) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(vi) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to--

(i) Small business concerns;

(ii) Veteran-owned small business concerns;

(iii) HUBZone small business concerns;

(iv) Small disadvantaged business concerns; and

(v) Women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Marketing and Access Network (PRO-Net) of the Small Business Administration (SBA), veterans service organizations, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small, HUBZone, small disadvantaged, and women-owned small business trade associations). A firm may rely on the information contained in PRO-Net as an accurate representation of a concern's size and ownership characteristics for the purposes of maintaining a small, veteran-owned small, HUBZone small, small disadvantaged, and women-owned small business source list. Use of PRO-Net as its source list does not relieve a firm of its responsibilities (e.g., outreach, assistance, counseling, or publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with—

- (i) Small business concerns;
- (ii) Veteran-owned small business concerns;
- (iii) HUBZone small business concerns;
- (iv) Small disadvantaged business concerns; and
- (v) Women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small business, veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause of this contract entitled "Utilization of Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) that receive subcontracts in excess of \$500,000 (\$1,000,000 for construction of any public facility) to adopt a subcontracting plan that complies with the requirements of this clause.

(10) Assurances that the offeror will--

- (i) Cooperate in any studies or surveys as may be required;
- (ii) Submit periodic reports so that the Government can determine the extent of compliance by the offeror with the subcontracting plan;
- (iii) Submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with paragraph (j) of this clause. The reports shall provide information on subcontract awards to small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, small disadvantaged business concerns, women-owned small business concerns, and Historically Black Colleges and Universities and Minority Institutions. Reporting shall be in accordance with the instructions on the forms or as provided in agency regulations.
- (iv) Ensure that its subcontractors agree to submit SF 294 and SF 295.

(11) A description of the types of records that will be maintained concerning procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of the offeror's efforts to locate small business, veteran-owned small business, service-disabled veteran-owned small

business, HUBZone small business, small disadvantaged business, and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated)

(i) Source lists (e.g., PRO-Net), guides, and other data that identify small business, veteran-owner small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small business, veteran-owned small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than \$100,000, indicating--

(A) Whether small business concerns were solicited and, if not, why not;

(B) Whether veteran-owned small business concerns were solicited and, if not, why not;

(C) Whether HUBZone small business concerns were solicited and, if not, why not;

(D) Whether small disadvantaged business concerns were solicited and, if not, why not;

(E) Whether women-owned small business concerns were solicited and, if not, why not; and

(F) If applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact--

(A) Trade associations;

(B) Business development organizations;

(C) Conferences and trade fairs to locate small, HUBZone small, small disadvantaged, and women-owned small business sources; and

(D) Veterans service organizations.

(v) Records of internal guidance and encouragement provided to buyers through--

(A) Workshops, seminars, training, etc.; and

(B) Monitoring performance to evaluate compliance with the program's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having commercial plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small business, veteran-owner small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the Contractor's lists of potential small business, veteran-owner small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned

small business subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small business, veteran-owner small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small business, veteran-owner small business, service-disabled veteran-owned small business, HUBZone small business, small disadvantaged business, and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, veteran-owner small business, HUBZone small, small disadvantaged, or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master plan on a plant or division-wide basis that contains all the elements required by paragraph (d) of this clause, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided--

(1) the master plan has been approved, (2) the offeror ensures that the master plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g) A commercial plan is the preferred type of subcontracting plan for contractors furnishing commercial items. The commercial plan shall relate to the offeror's planned subcontracting generally, for both commercial and Government business, rather than solely to the Government contract. Commercial plans are also preferred for subcontractors that provide commercial items under a prime contract, whether or not the prime contractor is supplying a commercial item.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization Of Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

(j) The Contractor shall submit the following reports:

(1) Standard Form 294, Subcontracting Report for Individual Contracts. This report shall be submitted to the Contracting Officer semiannually and at contract completion. The report covers subcontract award data related to this contract. This report is not required for commercial plans.

(2) Standard Form 295, Summary Subcontract Report. This report encompasses all of the contracts with the awarding agency. It must be submitted semi-annually for contracts with the Department of Defense and annually for contracts with civilian agencies. If the reporting activity is covered by a commercial plan, the reporting activity must report annually all subcontract awards under that plan. All reports submitted at the close of each fiscal year (both individual and commercial plans) shall include a breakout, in the Contractor's format, of subcontract awards, in whole dollars, to small disadvantaged business concerns by North American Industry Classification System (NAICS) Industry Subsector. For a commercial plan, the Contractor may obtain from each of its subcontractors a predominant NAICS Industry Subsector and report all awards to that subcontractor under its predominant NAICS Industry Subsector.

(End of clause)

**52.219-16 LIQUIDATED DAMAGES-SUBCONTRACTING PLAN (JAN 1999)**

(a) Failure to make a good faith effort to comply with the subcontracting plan, as used in this clause, means a willful or intentional failure to perform in accordance with the requirements of the subcontracting plan approved under the clause in this contract entitled "Small Business Subcontracting Plan," or willful or intentional action to frustrate the plan.

(b) Performance shall be measured by applying the percentage goals to the total actual subcontracting dollars or, if a commercial plan is involved, to the pro rata share of actual subcontracting dollars attributable to Government contracts covered by the commercial plan. If, at contract completion or, in the case of a commercial plan, at the close of the fiscal year for which the plan is applicable, the Contractor has failed to meet its subcontracting goals and the Contracting Officer decides in accordance with paragraph (c) of this clause that the Contractor failed to make a good faith effort to comply with its subcontracting plan, established in accordance with the clause in this contract entitled "Small Business Subcontracting Plan," the Contractor shall pay the Government liquidated damages in an amount stated. The amount of probable damages attributable to the Contractor's failure to comply shall be an amount equal to the actual dollar amount by which the Contractor failed to achieve each subcontract goal.

(c) Before the Contracting Officer makes a final decision that the Contractor has failed to make such good faith effort, the Contracting Officer shall give the Contractor written notice specifying the failure and permitting the Contractor to demonstrate what good faith efforts have been made and to discuss the matter. Failure to respond to the notice may be taken as an admission that no valid explanation exists. If, after consideration of all the pertinent data, the Contracting Officer finds that the Contractor failed to make a good faith effort to comply with the subcontracting plan, the Contracting Officer shall issue a final decision to that effect and require that the Contractor pay the Government liquidated damages as provided in paragraph (b) of this clause.

(d) With respect to commercial plans, the Contracting Officer who approved the plan will perform the functions of the Contracting Officer under this clause on behalf of all agencies with contracts covered by the commercial plan.

(e) The Contractor shall have the right of appeal, under the clause in this contract entitled Disputes, from any final decision of the Contracting Officer.

(f) Liquidated damages shall be in addition to any other remedies that the Government may have.

(End of clause)

**52.222-1 NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (FEB 1997)**

If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice, including all relevant information, to the Contracting Officer.

**52.222-3 CONVICT LABOR (AUG 1996)**

The Contractor agrees not to employ in the performance of this contract any person undergoing a sentence of imprisonment which has been imposed by any court of a State, the District of Columbia, the Commonwealth of

Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, or the Trust Territory of the Pacific Islands. This limitation, however, shall not prohibit the employment by the Contractor in the performance of this contract of persons on parole or probation to work at paid employment during the term of their sentence or persons who have been pardoned or who have served their terms. Nor shall it prohibit the employment by the Contractor in the performance of this contract of persons confined for violation of the laws of any of the States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, or the Trust Territory of the Pacific Islands who are authorized to work at paid employment in the community under the laws of such jurisdiction, if--

- (a)(1) The worker is paid or is in an approved work training program on a voluntary basis;
  - (2) Representatives of local union central bodies or similar labor union organizations have been consulted;
  - (3) Such paid employment will not result in the displacement of employed workers, or be applied in skills, crafts, or trades in which there is a surplus of available gainful labor in the locality, or impair existing contracts for services; and
  - (4) The rates of pay and other conditions of employment will not be less than those paid or provided for work of a similar nature in the locality in which the work is being performed; and
- (b) The Attorney General of the United States has certified that the work-release laws or regulations of the jurisdiction involved are in conformity with the requirements of Executive Order 11755, as amended by Executive Orders 12608 and 12943.

(End of clause)

**52.222-4 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION.  
(SEP 2000)**

- (a) Overtime requirements. No Contractor or subcontractor employing laborers or mechanics (see Federal Acquisition Regulation 22.300) shall require or permit them to work over 40 hours in any workweek unless they are paid at least 1 and 1/2 times the basic rate of pay for each hour worked over 40 hours.
- (b) Violation; liability for unpaid wages; liquidated damages. The responsible Contractor and subcontractor are liable for unpaid wages if they violate the terms in paragraph (a) of this clause. In addition, the Contractor and subcontractor are liable for liquidated damages payable to the Government. The Contracting Officer will assess liquidated damages at the rate of \$10 per affected employee for each calendar day on which the employer required or permitted the employee to work in excess of the standard workweek of 40 hours without paying overtime wages required by the Contract Work Hours and Safety Standards Act.
- (c) Withholding for unpaid wages and liquidated damages. The Contracting Officer will withhold from payments due under the contract sufficient funds required to satisfy any Contractor or subcontractor liabilities for unpaid wages and liquidated damages. If amounts withheld under the contract are insufficient to satisfy Contractor or subcontractor liabilities, the Contracting Officer will withhold payments from other Federal or Federally assisted contracts held by the same Contractor that are subject to the Contract Work Hours and Safety Standards Act.
- (d) Payrolls and basic records.
  - (1) The Contractor and its subcontractors shall maintain payrolls and basic payroll records for all laborers and mechanics working on the contract during the contract and shall make them available to the Government until 3 years after contract completion. The records shall contain the name and address of each employee, social security number, labor classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions



made, and actual wages paid. The records need not duplicate those required for construction work by Department of Labor regulations at 29 CFR 5.5(a)(3) implementing the Davis-Bacon Act.

(2) The Contractor and its subcontractors shall allow authorized representatives of the Contracting Officer or the Department of Labor to inspect, copy, or transcribe records maintained under paragraph (d)(1) of this clause. The Contractor or subcontractor also shall allow authorized representatives of the Contracting Officer or Department of Labor to interview employees in the workplace during working hours.

(e) Subcontracts. The Contractor shall insert the provisions set forth in paragraphs (a) through (d) of this clause in subcontracts exceeding \$100,000 and require subcontractors to include these provisions in any lower tier subcontracts. The Contractor shall be responsible for compliance by any subcontractor or lower-tier subcontractor with the provisions set forth in paragraphs (a) through (d) of this clause.

(End of clause)

#### **52.222-6 DAVIS-BACON ACT (FEB 1995)**

(a) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (d) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such period. Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled Apprentices and Trainees. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (b) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(b)(1) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination.

(ii) The classification is utilized in the area by the construction industry.

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their

representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator or an authorized representative will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(3) In the event the Contractor, the laborers or mechanics to be employed in the classification, or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (b)(2) and (b)(3) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(c) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(d) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

#### **52.222-7 WITHHOLDING OF FUNDS (FEB 1988)**

The Contracting Officer shall, upon his or her own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

#### **52.222-8 PAYROLLS AND BASIC RECORDS (FEB 1988)**

(a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe

benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under paragraph (d) of the clause entitled Davis-Bacon Act, that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(b)(1) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The Prime Contractor is responsible for the submission of copies of payrolls by all subcontractors.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify--

(i) That the payroll for the payroll period contains the information required to be maintained under paragraph (a) of this clause and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR Part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (b)(2) of this clause.

(4) The falsification of any of the certifications in this clause may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(c) The Contractor or subcontractor shall make the records required under paragraph (a) of this clause available for inspection, copying, or transcription by the Contracting Officer or authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit the Contracting Officer or representatives of the Contracting Officer or the Department of Labor to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

**52.222-9 APPRENTICES AND TRAINEES (FEB 1988)**

(a) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(b) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

**52.222-10 COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)**

The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

**52.222-11 SUBCONTRACTS (LABOR STANDARDS (FEB 1988)**

(a) The Contractor or subcontractor shall insert in any subcontracts the clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act-Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Withholding of Funds, Subcontracts (Labor Standards), Contract Termination-Debarment, Disputes Concerning Labor Standards, Compliance with Davis-Bacon and Related Act Regulations, and Certification of Eligibility, and such other clauses as the Contracting Officer may, by appropriate instructions, require, and also a clause requiring subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited in this paragraph.

(b)(1) Within 14 days after award of the contract, the Contractor shall deliver to the Contracting Officer a completed Statement and Acknowledgment Form (SF 1413) for each subcontract, including the subcontractor's signed and dated acknowledgment that the clauses set forth in paragraph (a) of this clause have been included in the subcontract.

(2) Within 14 days after the award of any subsequently awarded subcontract the Contractor shall deliver to the Contracting Officer an updated completed SF 1413 for such additional subcontract.

**52.222-12 CONTRACT TERMINATION--DEBARMENT (FEB 1988)**

A breach of the contract clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act--Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Subcontracts (Labor Standards), Compliance with Davis-Bacon and Related Act Regulations, or Certification of Eligibility may be grounds for termination of the contract, and for debarment as a Contractor and subcontractor as provided in 29 CFR 5.12.

**52.222-13 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)**

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are hereby incorporated by reference in this contract.

**52.222-14 DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)**

The United States Department of Labor has set forth in 29 CFR Parts 5, 6, and 7 procedures for resolving disputes concerning labor standards requirements. Such disputes shall be resolved in accordance with those procedures and not the Disputes clause of this contract. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

**52.222-15 CERTIFICATION OF ELIGIBILITY (FEB 1988)**

- (a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- (b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- (c) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

**52.222-21 PROHIBITION OF SEGREGATED FACILITIES (FEB 1999)**

- (a) Segregated facilities, as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.
- (b) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.
- (c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

(End of clause)

**52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION (FEB 1999)**

- (a) The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

| Goals for minority participation for each trade | Goals for female participation for each trade |
|---|---|
| 1.2%  | 6.9%  |

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the --

- (1) Name, address, and telephone number of the subcontractor;
- (2) Employer's identification number of the subcontractor;
- (3) Estimated dollar amount of the subcontract;
- (4) Estimated starting and completion dates of the subcontract; and
- (5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is **Grand Forks County, Grand Forks, North Dakota**

#### **52.222-26 EQUAL OPPORTUNITY (FEB 1999)**

(a) If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of \$10,000, the Contractor shall comply with subparagraphs (b)(1) through (11) of this clause. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.

(b) During performing this contract, the Contractor agrees as follows:

(1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. However, it shall not be a violation of this clause for the Contractor to extend a publicly announced preference in employment to Indians living on or near an Indian reservation, in connection with employment opportunities on or near an Indian reservation, as permitted by 41 CFR 60-1.5.

(2) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination, (vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.

(3) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(4) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(5) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(6) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(7) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. The Contractor shall also file Standard Form 100 (EEO-1), or any successor form, as prescribed in 41 CFR part 60-1. Unless the Contractor has filed within the 12 months preceding the date of contract award, the Contractor shall, within 30 days after contract award, apply to either the regional Office of Federal Contract Compliance Programs (OFCCP) or the local office of the Equal Employment Opportunity Commission for the necessary forms.

(8) The Contractor shall permit access to its premises, during normal business hours, by the contracting agency or the OFCCP for the purpose of conducting on-site compliance evaluations and complaint investigations. The Contractor shall permit the Government to inspect and copy any books, accounts, records (including computerized records), and other material that may be relevant to the matter under investigation and pertinent to compliance with Executive Order 11246, as amended, and rules and regulations that implement the Executive Order.

(9) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended; in the rules, regulations, and orders of the Secretary of Labor; or as otherwise provided by law.

(10) The Contractor shall include the terms and conditions of subparagraphs (b)(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting officer may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance;



provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(c) Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

(End of clause)

**52.222-27 AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (FEB 1999)**

(a) Definitions. "Covered area," as used in this clause, means the geographical area described in the solicitation for this contract.

"Deputy Assistant Secretary," as used in this clause, means Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, or a designee.

"Employer's identification number," as used in this clause, means the Federal Social Security number used on the employer's quarterly federal tax return, U.S. Treasury Department Form 941.

"Minority," as used in this clause, means--

(1) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(2) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);

(3) Black (all persons having origins in any of the black African racial groups not of Hispanic origin); and

(4) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race).

(b) If the Contractor, or a subcontractor at any tier, subcontracts a portion of the work involving any construction trade, each such subcontract in excess of \$10,000 shall include this clause and the Notice containing the goals for minority and female participation stated in the solicitation for this contract.

(c) If the Contractor is participating in a Hometown Plan (41 CFR 60-4) approved by the U.S. Department of Labor in a covered area, either individually or through an association, its affirmative action obligations on all work in the plan area (including goals) shall comply with the plan for those trades that have unions participating in the plan. Contractors must be able to demonstrate participation in, and compliance with, the provisions of the plan. Each Contractor or subcontractor participating in an approved plan is also required to comply with its obligations under the Equal Opportunity clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good-faith performance by other Contractors or subcontractors toward a goal in an approved plan does not excuse any Contractor's or subcontractor's failure to make good-faith efforts to achieve the plan's goals.

(d) The Contractor shall implement the affirmative action procedures in subparagraphs (g)(1) through (16) of this clause. The goals stated in the solicitation for this contract are expressed as percentages of the total hours of employment and training of minority and female utilization that the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where that work is actually performed. The Contractor is expected to make substantially uniform progress toward its goals in each craft.

(e) Neither the terms and conditions of any collective bargaining agreement, nor the failure by a union with which the Contractor has a collective bargaining agreement, to refer minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, as amended, or the regulations thereunder.

(f) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(g) The Contractor shall take affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:

(1) Ensure a working environment free of harassment, intimidation, and coercion at all sites and in all facilities where the Contractor's employees are assigned to work. The Contractor, if possible, will assign two or more women to each construction project. The Contractor shall ensure that foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at these sites or facilities.

(2) Establish and maintain a current list of sources for minority and female recruitment. Provide written notification to minority and female recruitment sources and community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

(3) Establish and maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant, referrals of minorities or females from unions, recruitment sources, or community organizations, and the action taken with respect to each individual. If an individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred back, not employed by the Contractor, this shall be documented in the file, along with whatever additional actions the Contractor may have taken.

(4) Immediately notify the Deputy Assistant Secretary when the union or unions with which the Contractor has a collective bargaining agreement has not referred back to the Contractor a minority or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area that expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under subparagraph (g)(2) of this clause.

(6) Disseminate the Contractor's equal employment policy by--

(i) Providing notice of the policy to unions and to training, recruitment, and outreach programs, and requesting their cooperation in assisting the Contractor in meeting its contract obligations;

(ii) Including the policy in any policy manual and in collective bargaining agreements;

(iii) Publicizing the policy in the company newspaper, annual report, etc.;

(iv) Reviewing the policy with all management personnel and with all minority and female employees at least once a year; and

(v) Posting the policy on bulletin boards accessible to employees at each location where construction work is performed.

(7) Review, at least annually, the Contractor's equal employment policy and affirmative action obligations with all employees having responsibility for hiring, assignment, layoff, termination, or other employment decisions. Conduct review of this policy with all on-site supervisory personnel before initiating construction work at a job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's equal employment policy externally by including it in any advertising in the news media, specifically including minority and female news media. Provide written notification to, and discuss this policy with, other Contractors and subcontractors with which the Contractor does or anticipates doing business.

(9) Direct recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than 1 month before the date for acceptance of applications for apprenticeship or training by any recruitment source, send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit minority persons and women. Where reasonable, provide after-school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's workforce.

(11) Validate all tests and other selection requirements where required under 41 CFR 60-3.

(12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities. Encourage these employees to seek or to prepare for, through appropriate training, etc., opportunities for promotion.

(13) Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the Contractor's obligations under this contract are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user rest rooms and necessary dressing or sleeping areas shall be provided to assure privacy between the sexes.

(15) Maintain a record of solicitations for subcontracts for minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's equal employment policy and affirmative action obligations.

(h) The Contractor is encouraged to participate in voluntary associations that may assist in fulfilling one or more of the affirmative action obligations contained in subparagraphs (g)(1) through (16) of this clause. The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant may be asserted as fulfilling one or more of its obligations under subparagraphs (g)(1) through (16) of this clause, provided the Contractor--

(1) Actively participates in the group;

(2) Makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry;

(3) Ensures that concrete benefits of the program are reflected in the Contractor's minority and female workforce

participation;

(4) Makes a good-faith effort to meet its individual goals and timetables; and

(5) Can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply is the Contractor's, and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

(i) A single goal for minorities and a separate single goal for women shall be established. The Contractor is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of Executive Order 11246, as amended, if a particular group is employed in a substantially disparate manner.

(j) The Contractor shall not use goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(k) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts under Executive Order 11246, as amended.

(l) The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal Opportunity clause, including suspension, termination, and cancellation of existing subcontracts, as may be imposed or ordered under Executive Order 11246, as amended, and its implementing regulations, by the OFCCP. Any failure to carry out these sanctions and penalties as ordered shall be a violation of this clause and Executive Order 11246, as amended.

(m) The Contractor in fulfilling its obligations under this clause shall implement affirmative action procedures at least as extensive as those prescribed in paragraph (g) of this clause, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or this clause, the Deputy Assistant Secretary shall take action as prescribed in 41 CFR 60-4.8.

(n) The Contractor shall designate a responsible official to--

(1) Monitor all employment-related activity to ensure that the Contractor's equal employment policy is being carried out;

(2) Submit reports as may be required by the Government; and

(3) Keep records that shall at least include for each employee the name, address, telephone number, construction trade, union affiliation (if any), employee identification number, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, separate records are not required to be maintained.

Nothing contained herein shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

**52.222-35 EQUAL OPPORTUNITY FOR SPECIAL DISABLED VETERANS, VETERANS OF THE VIETNAM ERA AND OTHER ELIGIBLE VETERANS (DEC 2001)**

(a) Definitions. As used in this clause--

All employment openings means all positions except executive and top management, those positions that will be filled from within the Contractor's organization, and positions lasting 3 days or less. This term includes full-time employment, temporary employment of more than 3 days duration, and part-time employment.

Executive and top management means any employee--

(1) Whose primary duty consists of the management of the enterprise in which the individual is employed or of a customarily recognized department or subdivision thereof;

(2) Who customarily and regularly directs the work of two or more other employees;

(3) Who has the authority to hire or fire other employees or whose suggestions and recommendations as to the hiring or firing and as to the advancement and promotion or any other change of status of other employees will be given particular weight;

(4) Who customarily and regularly exercises discretionary powers; and

(5) Who does not devote more than 20 percent or, in the case of an employee of a retail or service establishment, who does not devote more than 40 percent of total hours of work in the work week to activities that are not directly and closely related to the performance of the work described in paragraphs (1) through (4) of this definition. This paragraph (5) does not apply in the case of an employee who is in sole charge of an establishment or a physically separated branch establishment, or who owns at least a 20 percent interest in the enterprise in which the individual is employed.

Other eligible veteran means any other veteran who served on active duty during a war or in a campaign or expedition for which a campaign badge has been authorized.

Positions that will be filled from within the Contractor's organization means employment openings for which the Contractor will give no consideration to persons outside the Contractor's organization (including any affiliates, subsidiaries, and parent companies) and includes any openings the Contractor proposes to fill from regularly established "recall" lists. The exception does not apply to a particular opening once an employer decides to consider applicants outside of its organization.

Qualified special disabled veteran means a special disabled veteran who satisfies the requisite skill, experience, education, and other job-related requirements of the employment position such veteran holds or desires, and who, with or without reasonable accommodation, can perform the essential functions of such position.

Special disabled veteran means--

(1) A veteran who is entitled to compensation (or who but for the receipt of military retired pay would be entitled to compensation) under laws administered by the Department of Veterans Affairs for a disability--

(i) Rated at 30 percent or more; or

(ii) Rated at 10 or 20 percent in the case of a veteran who has been determined under 38 U.S.C. 3106 to have a serious employment handicap (i.e., a significant impairment of the veteran's ability to prepare for, obtain, or retain employment consistent with the veteran's abilities, aptitudes, and interests); or

(2) A person who was discharged or released from active duty because of a service-connected disability.

Veteran of the Vietnam era means a person who--

(1) Served on active duty for a period of more than 180 days and was discharged or released from active duty with other than a dishonorable discharge, if any part of such active duty occurred--

(i) In the Republic of Vietnam between February 28, 1961, and May 7, 1975; or

(ii) Between August 5, 1964, and May 7, 1975, in all other cases; or

(2) Was discharged or released from active duty for a service-connected disability if any part of the active duty was performed--

(i) In the Republic of Vietnam between February 28, 1961, and May 7, 1975; or

(ii) Between August 5, 1964, and May 7, 1975, in all other cases.

(b) General. (1) The Contractor shall not discriminate against the individual because the individual is a special disabled veteran, a veteran of the Vietnam era, or other eligible veteran, regarding any position for which the employee or applicant for employment is qualified. The Contractor shall take affirmative action to employ, advance in employment, and otherwise treat qualified special disabled veterans, veterans of the Vietnam era, and other eligible veterans without discrimination based upon their disability or veterans' status in all employment practices such as--

(i) Recruitment, advertising, and job application procedures;

(ii) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff and rehiring;

(iii) Rate of pay or any other form of compensation and changes in compensation;

(iv) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;

(v) Leaves of absence, sick leave, or any other leave;

(vi) Fringe benefits available by virtue of employment, whether or not administered by the Contractor;

(vii) Selection and financial support for training, including apprenticeship, and on-the-job training under 38 U.S.C. 3687, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;

(viii) Activities sponsored by the Contractor including social or recreational programs; and

(ix) Any other term, condition, or privilege of employment.

(2) The Contractor shall comply with the rules, regulations, and relevant orders of the Secretary of Labor issued under the Vietnam Era Veterans' Readjustment Assistance Act of 1972 (the Act), as amended (38 U.S.C. 4211 and 4212).

(c) Listing openings. (1) The Contractor shall immediately list all employment openings that exist at the time of the execution of this contract and those which occur during the performance of this contract, including those not generated by this contract, and including those occurring at an establishment of the Contractor other than the one where the contract is being performed, but excluding those of independently operated corporate affiliates, at an appropriate local public employment service office of the State wherein the opening occurs. Listing employment openings with the U.S. Department of Labor's America's Job Bank shall satisfy the requirement to list jobs with the local employment service office.

(2) The Contractor shall make the listing of employment openings with the local employment service office at least concurrently with using any other recruitment source or effort and shall involve the normal obligations of placing a bona fide job order, including accepting referrals of veterans and nonveterans. This listing of employment openings does not require hiring any particular job applicant or hiring from any particular group of job applicants and is not intended to relieve the Contractor from any requirements of Executive orders or regulations concerning nondiscrimination in employment.

(3) Whenever the Contractor becomes contractually bound to the listing terms of this clause, it shall advise the State public employment agency in each State where it has establishments of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these terms and has so advised the State agency, it need not advise the State agency of subsequent contracts. The Contractor may advise the State agency when it is no longer bound by this contract clause.

(d) Applicability. This clause does not apply to the listing of employment openings that occur and are filled outside the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, American Samoa, Guam, the Virgin Islands of the United States, and Wake Island.

(e) Postings. (1) The Contractor shall post employment notices in conspicuous places that are available to employees and applicants for employment.

(2) The employment notices shall--

(i) State the rights of applicants and employees as well as the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified employees and applicants who are special disabled veterans, veterans of the Vietnam era, and other eligible veterans; and

(ii) Be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance Programs, Department of Labor (Deputy Assistant Secretary of Labor), and provided by or through the Contracting Officer.

(3) The Contractor shall ensure that applicants or employees who are special disabled veterans are informed of the contents of the notice (e.g., the Contractor may have the notice read to a visually disabled veteran, or may lower the posted notice so that it can be read by a person in a wheelchair).

(4) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement, or other contract understanding, that the Contractor is bound by the terms of the Act and is committed to take affirmative action to employ, and advance in employment, qualified special disabled veterans, veterans of the Vietnam era, and other eligible veterans.

(f) Noncompliance. If the Contractor does not comply with the requirements of this clause, the Government may take appropriate actions under the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(g) Subcontracts. The Contractor shall insert the terms of this clause in all subcontracts or purchase orders of \$25,000 or more unless exempted by rules, regulations, or orders of the Secretary of Labor. The Contractor shall act as specified by the Deputy Assistant Secretary of Labor to enforce the terms, including action for noncompliance.

(End of clause)

#### **52.222-36 AFFIRMATIVE ACTION FOR WORKERS WITH DISABILITIES (JUN 1998)**

(a) General. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental disability. The

Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified individuals with disabilities without discrimination based upon their physical or mental disability in all employment practices such as--

- (i) Recruitment, advertising, and job application procedures;
- (ii) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff, and rehiring;
- (iii) Rates of pay or any other form of compensation and changes in compensation;
- (iv) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;
- (v) Leaves of absence, sick leave, or any other leave;
- (vi) Fringe benefits available by virtue of employment, whether or not administered by the Contractor;
- (vii) Selection and financial support for training, including apprenticeships, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;
- (viii) Activities sponsored by the Contractor, including social or recreational programs; and
- (ix) Any other term, condition, or privilege of employment.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.

(b) Postings. (1) The Contractor agrees to post employment notices stating--

(i) The Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified individuals with disabilities; and

(ii) The rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. The Contractor shall ensure that applicants and employees with disabilities are informed of the contents of the notice (e.g., the Contractor may have the notice read to a visually disabled individual, or may lower the posted notice so that it might be read by a person in a wheelchair). The notices shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance of the U.S. Department of Labor (Deputy Assistant Secretary) and shall be provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Act and is committed to take affirmative action to employ, and advance in employment, qualified individuals with physical or mental disabilities.

(c) Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(d) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of \$10,000 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

(End of clause)



**52.222-37 EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS, VETERANS OF THE VIETNAM ERA, AND OTHER ELIGIBLE VETERANS (DEC 2001)**

(a) Unless the Contractor is a State or local government agency, the Contractor shall report at least annually, as required by the Secretary of Labor, on--

(1) The number of special disabled veterans, the number of veterans of the Vietnam era, and other eligible veterans in the workforce of the Contractor by job category and hiring location; and

(2) The total number of new employees hired during the period covered by the report, and of the total, the number of special disabled veterans, the number of veterans of the Vietnam era, and the number of other eligible veterans; and

(3) The maximum number and the minimum number of employees of the Contractor during the period covered by the report.

(b) The Contractor shall report the above items by completing the Form VETS-100, entitled "Federal Contractor Veterans" Employment Report (VETS-100 Report)".

(c) The Contractor shall submit VETS-100 Reports no later than September 30 of each year beginning September 30, 1988.

(d) The employment activity report required by paragraph (a)(2) of this clause shall reflect total hires during the most recent 12-month period as of the ending date selected for the employment profile report required by paragraph (a)(1) of this clause. Contractors may select an ending date--

(1) As of the end of any pay period between July 1 and August 31 of the year the report is due; or

(2) As of December 31, if the Contractor has prior written approval from the Equal Employment Opportunity Commission to do so for purposes of submitting the Employer Information Report EEO-1 (Standard Form 100).

(e) The Contractor shall base the count of veterans reported according to paragraph (a) of this clause on voluntary disclosure. Each Contractor subject to the reporting requirements at 38 U.S.C. 4212 shall invite all special disabled veterans, veterans of the Vietnam era, and other eligible veterans who wish to benefit under the affirmative action program at 38 U.S.C. 4212 to identify themselves to the Contractor. The invitation shall state that--

(1) The information is voluntarily provided;

(2) The information will be kept confidential;

(3) Disclosure or refusal to provide the information will not subject the applicant or employee to any adverse treatment; and

(4) The information will be used only in accordance with the regulations promulgated under 38 U.S.C. 4212.

(f) The Contractor shall insert the terms of this clause in all subcontracts or purchase orders of \$25,000 or more unless exempted by rules, regulations, or orders of the Secretary of Labor.

(End of clause)

**52.223-5 POLLUTION PREVENTION AND RIGHT-TO-KNOW INFORMATION (APR 1998)**

(a) Executive Order 12856 of August 3, 1993, requires Federal facilities to comply with the provisions of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA)(42 U.S.C. 11001-11050) and the Pollution Prevention Act of 1990 (PPA)(42 U.S.C. 13101-13109).

(b) The Contractor shall provide all information needed by the Federal facility to comply with the emergency planning reporting requirements of Section 302 of EPCRA; the emergency notice requirements of Section 304 of EPCRA; the list of Material Safety Data Sheets required by Section 311 of EPCRA; the emergency and hazardous chemical inventory forms of Section 312 of EPCRA; the toxic chemical release inventory of Section 313 of EPCRA, which includes the reduction and recycling information required by Section 6607 of PPA; and the toxic chemical reduction goals requirements of Section 3-302 of Executive Order 12856.

-----

**52.223-6 DRUG-FREE WORKPLACE (MAY 2001)**

(a) Definitions. As used in this clause --

"Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11 - 1308.15.

"Conviction" means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes.

"Criminal drug statute" means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, possession, or use of any controlled substance.

"Drug-free workplace" means the site(s) for the performance of work done by the Contractor in connection with a specific contract where employees of the Contractor are prohibited from engaging in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance.

"Employee" means an employee of a Contractor directly engaged in the performance of work under a Government contract. "Directly engaged" is defined to include all direct cost employees and any other Contractor employee who has other than a minimal impact or involvement in contract performance.

"Individual" means an offeror/contractor that has no more than one employee including the offeror/contractor.

(b) The Contractor, if other than an individual, shall-- within 30 days after award (unless a longer period is agreed to in writing for contracts of 30 days or more performance duration), or as soon as possible for contracts of less than 30 days performance duration--

(1) Publish a statement notifying its employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition;

(2) Establish an ongoing drug-free awareness program to inform such employees about--

(i) The dangers of drug abuse in the workplace;

- (ii) The Contractor's policy of maintaining a drug-free workplace;
  - (iii) Any available drug counseling, rehabilitation, and employee assistance programs; and
  - (iv) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;
- (3) Provide all employees engaged in performance of the contract with a copy of the statement required by subparagraph (b)(1) of this clause;
- (4) Notify such employees in writing in the statement required by subparagraph (b)(1) of this clause that, as a condition of continued employment on this contract, the employee will--
- (i) Abide by the terms of the statement; and
  - (ii) Notify the employer in writing of the employee's conviction under a criminal drug statute for a violation occurring in the workplace no later than 5 days after such conviction.
- (5) Notify the Contracting Officer in writing within 10 days after receiving notice under subdivision (b)(4)(ii) of this clause, from an employee or otherwise receiving actual notice of such conviction. The notice shall include the position title of the employee;
- (6) Within 30 days after receiving notice under subdivision (b)(4)(ii) of this clause of a conviction, take one of the following actions with respect to any employee who is convicted of a drug abuse violation occurring in the workplace:
- (i) Taking appropriate personnel action against such employee, up to and including termination; or
  - (ii) Require such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency; and
- (7) Make a good faith effort to maintain a drug-free workplace through implementation of subparagraphs (b)(1) through (b)(6) of this clause.
- (c) The Contractor, if an individual, agrees by award of the contract or acceptance of a purchase order, not to engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance while performing this contract.
- (d) In addition to other remedies available to the Government, the Contractor's failure to comply with the requirements of paragraph (b) or (c) of this clause may, pursuant to FAR 23.506, render the Contractor subject to suspension of contract payments, termination of the contract for default, and suspension or debarment.
- (End of clause)

#### **52.223-14 TOXIC CHEMICAL RELEASE REPORTING (OCT 2000)**

- (a) Unless otherwise exempt, the Contractor, as owner or operator of a facility used in the performance of this contract, shall file by July 1 for the prior calendar year an annual Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023(a) and (g)), and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106). The Contractor shall file, for each facility subject to the Form R filing and reporting requirements, the annual Form R throughout the life of the contract.

(b) A Contractor owned or operated facility used in the performance of this contract is exempt from the requirement to file an annual Form R if--

(1) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

(2) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

(3) The facility does not meet the reporting thresholds of toxic chemicals established under of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

(4) The facility does not fall within Standard Industrial Classification Code (SIC) major groups 20 through 39 or their corresponding North American Industry Classification System (NAICS) sectors 31 through 33; or

(5) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(c) If the Contractor has certified to an exemption in accordance with one or more of the criteria in paragraph (b) of this clause, and after award of the contract circumstances change so that any of its owned or operated facilities used in the performance of this contract is no longer exempt--

(1) The Contractor shall notify the Contracting Officer; and

(2) The Contractor, as owner or operator of a facility used in the performance of this contract that is no longer exempt, shall (i) submit a Toxic Chemical Release Inventory Form (Form R) on or before July 1 for the prior calendar year during which the facility becomes eligible; and (ii) continue to file the annual Form R for the life of the contract for such facility.

(d) The Contracting Officer may terminate this contract or take other action as appropriate, if the Contractor fails to comply accurately and fully with the EPCRA and PPA toxic chemical release filing and reporting requirements.

(e) Except for acquisitions of commercial items, as defined in FAR Part 2, the Contractor shall--

(1) For competitive subcontracts expected to exceed \$100,000 (including all options), include a solicitation provision substantially the same as the provision at FAR 52.223-13, Certification of Toxic Chemical Release Reporting; and

(2) Include in any resultant subcontract exceeding \$100,000 (including all options), the substance of this clause, except this paragraph (e).

#### **52.225-13 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (JUL 2000)**

(a) The Contractor shall not acquire, for use in the performance of this contract, any supplies or services originating from sources within, or that were located in or transported from or through, countries whose products are banned from importation into the United States under regulations of the Office of Foreign Assets Control, Department of the Treasury. Those countries are Cuba, Iran, Iraq, Libya, North Korea, Sudan, the territory of Afghanistan controlled by the Taliban, and Serbia (excluding the territory of Kosovo).

(b) The Contractor shall not acquire for use in the performance of this contract any supplies or services from entities controlled by the government of Iraq.

(c) The Contractor shall insert this clause, including this paragraph (c), in all subcontracts.

(End of clause)

**52.226-1 UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC ENTERPRISES (JUN 2000)**

(a) Definitions. As used in this clause:

"Indian" means any person who is a member of any Indian tribe, band, group, pueblo or community that is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs (BIA) in accordance with 25 U.S.C. 1452(c) and any "Native" as defined in the Alaska Native Claims Settlement Act (43 U.S.C. 1601).

"Indian organization" means the governing body of any Indian tribe or entity established or recognized by the governing body of an Indian tribe for the purposes of 25 U.S.C., chapter 17.

"Indian-owned economic enterprise" means any Indian-owned (as determined by the Secretary of the Interior) commercial, industrial, or business activity established or organized for the purpose of profit, provided that Indian ownership constitute a not less than 51 percent of the enterprise.

"Indian tribe" means any Indian tribe, band, group, pueblo or community, including native villages and native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, that is recognized by the Federal Government as eligible for services from BIA in accordance with 25 U.S.C. 1542(c).

"Interested party" means a prime contractor or an actual or prospective offeror whose direct economic interest would be affected by the award of a subcontract or by the failure to award a subcontract.

(b) The Contractor shall use its best efforts to give Indian organizations and Indian-owned economic enterprises (25 U.S.C. 1544) the maximum practicable opportunity to participate in the subcontracts it awards to the fullest extent consistent with efficient performance of its contract.

(1) The Contracting Officer and the Contractor, acting in good faith, may rely on the representation of an Indian organization or Indian-owned economic enterprise as to its eligibility, unless an interested party challenges its status or the Contracting Officer has independent reason to question that status. In the event of a challenge to the representation of a subcontractor, the Contracting Officer will refer the matter to the U.S. Department of the Interior, Bureau of Indian Affairs (BIA), Attn: Chief, Division of Contracting and Grants Administration, 1849 C Street, NW., MS 2626-MIB, Washington, DC 20240-4000.

The BIA will determine the eligibility and notify the Contracting Officer. No incentive payment will be made within 50 working days of subcontract award or while a challenge is pending. If a subcontractor is determined to be an ineligible participant, no incentive payment will be made under the Indian Incentive Program.

(2) The Contractor may request an adjustment under the Indian Incentive Program to the following:

(i) The estimated cost of a cost-type contract.

- (ii) The target cost of a cost-plus-incentive-fee prime contract.
  - (iii) The target cost and ceiling price of a fixed-price incentive prime contract.
  - (iv) The price of a firm-fixed-price prime contract.
- (3) The amount of the adjustment to the prime contract is 5 percent of the estimated cost, target cost, or firm-fixed-price included in the subcontract initially awarded to the Indian organization or Indian-owned economic enterprise.
- (4) The Contractor has the burden of proving the amount claimed and must assert its request for an adjustment prior to completion of contract performance.
- (c) The Contracting Officer, subject to the terms and conditions of the contract and the availability of funds, will authorize an incentive payment of 5 percent of the amount paid to the subcontractor. The Contracting Officer will seek funding in accordance with agency procedures.
- (End of clause)

**52.227-1 AUTHORIZATION AND CONSENT (JUL 1995)**

- (a) The Government authorizes and consents to all use and manufacture, in performing this contract or any subcontract at any tier, of any invention described in and covered by a United States patent (1) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract or (2) used in machinery, tools, or methods whose use necessarily results from compliance by the Contractor or a subcontractor with (i) specifications or written provisions forming a part of this contract or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clause, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.
- (b) The Contractor agrees to include, and require inclusion of, this clause, suitably modified to identify the parties, in all subcontracts at any tier for supplies or services (including construction, architect-engineer services, and materials, supplies, models, samples, and design or testing services expected to exceed the simplified acquisition threshold (however, omission of this clause from any subcontract, including those at or below the simplified acquisition threshold, does not affect this authorization and consent.)

**52.227-2 NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (AUG 1996)**

- (a) The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.
- (b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or

services performed under this contract, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.

(c) The Contractor agrees to include, and require inclusion of, this clause in all subcontracts at any tier for supplies or services (including construction and architect-engineer subcontracts and those for material, supplies, models, samples, or design or testing services) expected to exceed the simplified acquisition threshold at (FAR) 2.101 to exceed the dollar amount set forth in 13.000 of the Federal Acquisition Regulation (FAR).

(End of clause)

#### **52.227-4 PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984)**

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any United States patent (except a patent issued upon an application that is now or may hereafter be withheld from issue pursuant to a Secrecy Order under 35 U.S.C. 181) arising out of performing this contract or out of the use or disposal by or for the account of the Government of supplies furnished or work performed under this contract.

#### **52.228-1 BID GUARANTEE (SEP 1996)**

(a) Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

(b) The bidder shall furnish a bid guarantee in the form of a firm commitment, e.g., bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.

(c) The amount of the bid guarantee shall be 20% percent of the bid price or \$3 million, whichever is less.

(d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.

(e) In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

#### **52.228-2 ADDITIONAL BOND SECURITY (OCT 1997)**

The Contractor shall promptly furnish additional security required to protect the Government and persons supplying labor or materials under this contract if--

- (a) Any surety upon any bond, or issuing financial institution for other security, furnished with this contract becomes unacceptable to the Government.
- (b) Any surety fails to furnish reports on its financial condition as required by the Government;
- (c) The contract price is increased so that the penal sum of any bond becomes inadequate in the opinion of the Contracting Officer; or
- (d) An irrevocable letter of credit (ILC) used as security will expire before the end of the period of required security. If the Contractor does not furnish an acceptable extension or replacement ILC, or other acceptable substitute, at least 30 days before an ILC's scheduled expiration, the Contracting officer has the right to immediately draw on the ILC.

**52.228-11 PLEDGES OF ASSETS (FEB 1992)**

- (a) Offerors shall obtain from each person acting as an individual surety on a bid guarantee, a performance bond, or a payment bond--
    - (1) Pledge of assets; and
    - (2) Standard Form 28, Affidavit of Individual Surety.
  - (b) Pledges of assets from each person acting as an individual surety shall be in the form of--
    - (1) Evidence of an escrow account containing cash, certificates of deposit, commercial or Government securities, or other assets described in FAR 28.203-2 (except see 28.203-2(b)(2) with respect to Government securities held in book entry form) and/or;
    - (2) A recorded lien on real estate. The offeror will be required to provide--
      - (i) Evidence of title in the form of a certificate of title prepared by a title insurance company approved by the United States Department of Justice. This title evidence must show fee simple title vested in the surety along with any concurrent owners; whether any real estate taxes are due and payable; and any recorded encumbrances against the property, including the lien filed in favor of the Government as required by FAR 28.203-3(d);
      - (ii) Evidence of the amount due under any encumbrance shown in the evidence of title;
      - (iii) A copy of the current real estate tax assessment of the property or a current appraisal dated no earlier than 6 months prior to the date of the bond, prepared by a professional appraiser who certifies that the appraisal has been conducted in accordance with the generally accepted appraisal standards as reflected in the Uniform Standards of Professional Appraisal Practice, as promulgated by the Appraisal Foundation.
- (End of clause)

**52.228-14 IRREVOCABLE LETTER OF CREDIT (DEC 1999)**

- (a) "Irrevocable letter of credit" (ILC), as used in this clause, means a written commitment by a federally insured financial institution to pay all or part of a stated amount of money, until the expiration date of the letter, upon presentation by the Government (the beneficiary) of a written demand therefor. Neither the financial institution nor the offeror/Contractor can revoke or condition the letter of credit.



(b) If the offeror intends to use an ILC in lieu of a bid bond, or to secure other types of bonds such as performance and payment bonds, the letter of credit and letter of confirmation formats in paragraphs (e) and (f) of this clause shall be used.

(c) The letter of credit shall be irrevocable, shall require presentation of no document other than a written demand and the ILC (including confirming letter, if any), shall be issued/confirmed by an acceptable federally insured financial institution as provided in paragraph (d) of this clause, and--

(1) If used as a bid guarantee, the ILC shall expire no earlier than 60 days after the close of the bid acceptance period;

(2) If used as an alternative to corporate or individual sureties as security for a performance or payment bond, the offeror/Contractor may submit an ILC with an initial expiration date estimated to cover the entire period for which financial security is required or may submit an ILC with an initial expiration date that is a minimum period of one year from the date of issuance. The ILC shall provide that, unless the issuer provides the beneficiary written notice of non-renewal at least 60 days in advance of the current expiration date, the ILC is automatically extended without amendment for one year from the expiration date, or any future expiration date, until the period of required coverage is completed and the Contracting Officer provides the financial institution with a written statement waiving the right to payment. The period of required coverage shall be:

(i) For contracts subject to the Miller Act, the later of--

(A) One year following the expected date of final payment;

(B) For performance bonds only, until completion of any warranty period; or

(C) For payment bonds only, until resolution of all claims filed against the payment bond during the one-year period following final payment.

(ii) For contracts not subject to the Miller Act, the later of--

(A) 90 days following final payment; or

(B) For performance bonds only, until completion of any warranty period.

(d) Only federally insured financial institutions rated investment grade or higher shall issue or confirm the ILC. The offeror/Contractor shall provide the Contracting Officer a credit rating that indicates the financial institution has the required rating(s) as of the date of issuance of the ILC. Unless the financial institution issuing the ILC had letter of credit business of less than \$25 million in the past year, ILCs over \$5 million must be confirmed by another acceptable financial institution that had letter of credit business of less than \$25 million in the past year.

(e) The following format shall be used by the issuing financial institution to create an ILC:

\_\_\_\_\_  
[Issuing Financial Institution's Letterhead or Name and Address]

Issue Date \_\_\_\_\_

IRREVOCABLE LETTER OF CREDIT NO. \_\_\_\_\_

Account party's name \_\_\_\_\_

Account party's address \_\_\_\_\_

For Solicitation No. \_\_\_\_\_ (for reference only)

TO: [U.S. Government agency]

[U.S. Government agency's address]

1. We hereby establish this irrevocable and transferable Letter of Credit in your favor for one or more drawings up to United States \$ \_\_\_\_\_. This Letter of Credit is payable at [issuing financial institution's and, if any, confirming financial institution's] office at [issuing financial institution's address and, if any, confirming financial institution's address] and expires with our close of business on \_\_\_\_\_, or any automatically extended expiration date.

2. We hereby undertake to honor your or the transferee's sight draft(s) drawn on the issuing or, if any, the confirming financial institution, for all or any part of this credit if presented with this Letter of Credit and confirmation, if any, at the office specified in paragraph 1 of this Letter of Credit on or before the expiration date or any automatically extended expiration date.

3. [This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.] It is a condition of this Letter of Credit that it is deemed to be automatically extended without amendment for one year from the expiration date hereof, or any future expiration date, unless at least 60 days prior to any expiration date, we notify you or the transferee by registered mail, or other receipted means of delivery, that we elect not to consider this Letter of Credit renewed for any such additional period. At the time we notify you, we also agree to notify the account party (and confirming financial institution, if any) by the same means of delivery.

4. This Letter of Credit is transferable. Transfers and assignments of proceeds are to be effected without charge to either the beneficiary or the transferee/assignee of proceeds. Such transfer or assignment shall be only at the written direction of the Government (the beneficiary) in a form satisfactory to the issuing financial institution and the confirming financial institution, if any.

5. This Letter of Credit is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of \_\_\_\_\_ [state of confirming financial institution, if any, otherwise state of issuing financial institution].

6. If this credit expires during an interruption of business of this financial institution as described in Article 17 of the UCP, the financial institution specifically agrees to effect payment if this credit is drawn against within 30 days after the resumption of our business.

Sincerely,

\_\_\_\_\_

[Issuing financial institution]

(f) The following format shall be used by the financial institution to confirm an ILC:

\_\_\_\_\_  
[Confirming Financial Institution's Letterhead or Name and Address]

(Date) \_\_\_\_\_

Our Letter of Credit Advice Number \_\_\_\_\_

Beneficiary: \_\_\_\_\_ [U.S. Government agency]

Issuing Financial Institution: \_\_\_\_\_

Issuing Financial Institution's LC No.: \_\_\_\_\_

Gentlemen:

1. We hereby confirm the above indicated Letter of Credit, the original of which is attached, issued by \_\_\_\_\_ [name of issuing financial institution] for drawings of up to United States dollars \_\_\_\_\_/U.S. \$\_\_\_\_\_ and expiring with our close of business on \_\_\_\_\_ [the expiration date], or any automatically extended expiration date.

2. Draft(s) drawn under the Letter of Credit and this Confirmation are payable at our office located at \_\_\_\_\_.

3. We hereby undertake to honor sight draft(s) drawn under and presented with the Letter of Credit and this Confirmation at our offices as specified herein.

4. [This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.] It is a condition of this confirmation that it be deemed automatically extended without amendment for one year from the expiration date hereof, or any automatically extended expiration date, unless:

(a) At least 60 days prior to any such expiration date, we shall notify the Contracting Officer, or the transferee and the issuing financial institution, by registered mail or other receipted means of delivery, that we elect not to consider this confirmation extended for any such additional period; or

(b) The issuing financial institution shall have exercised its right to notify you or the transferee, the account party, and ourselves, of its election not to extend the expiration date of the Letter of Credit.

5. This confirmation is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of \_\_\_\_\_ [state of confirming financial institution].

6. If this confirmation expires during an interruption of business of this financial institution as described in Article 17 of the UCP, we specifically agree to effect payment if this credit is drawn against within 30 days after the resumption of our business.

Sincerely,

\_\_\_\_\_

[Confirming financial institution]

(g) The following format shall be used by the Contracting Officer for a sight draft to draw on the Letter of Credit:

SIGHT DRAFT

\_\_\_\_\_

[City, State]

(Date) \_\_\_\_\_

[Name and address of financial institution]

Pay to the order of \_\_\_\_\_ [Beneficiary Agency] \_\_\_\_\_ the sum of United States \$\_\_\_\_\_.

This draft is drawn under Irrevocable Letter of Credit No. \_\_\_\_\_.

\_\_\_\_\_  
[Beneficiary Agency]

By: \_\_\_\_\_

(End of clause)

**52.228-15 PERFORMANCE AND PAYMENT BONDS--CONSTRUCTION (JUL 2000)-**

(a) Definitions. As used in this clause--

Original contract price means the award price of the contract; or, for requirements contracts, the price payable for the estimated total quantity; or, for indefinite-quantity contracts, the price payable for the specified minimum quantity. Original contract price does not include the price of any options, except those options exercised at the time of contract award.

(b) Amount of required bonds. Unless the resulting contract price is \$100,000 or less, the successful offeror shall furnish performance and payment bonds to the Contracting Officer as follows:

(1) Performance bonds (Standard Form 25). The penal amount of performance bonds at the time of contract award shall be 100 percent of the original contract price.

(2) Payment Bonds (Standard Form 25-A). The penal amount of payment bonds at the time of contract award shall be 100 percent of the original contract price.

(3) Additional bond protection. (i) The Government may require additional performance and payment bond protection if the contract price is increased. The increase in protection generally will equal 100 percent of the increase in contract price.

(ii) The Government may secure the additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.

(c) Furnishing executed bonds. The Contractor shall furnish all executed bonds, including any necessary reinsurance agreements, to the Contracting Officer, within the time period specified in the Bid Guarantee provision of the solicitation, or otherwise specified by the Contracting Officer, but in any event, before starting work.

(d) Surety or other security for bonds. The bonds shall be in the form of firm commitment, supported by corporate sureties whose names appear on the list contained in Treasury Department Circular 570, individual sureties, or by other acceptable security such as postal money order, certified check, cashier's check, irrevocable letter of credit, or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. Treasury Circular 570 is published in the Federal Register or may be obtained from the U.S. Department of Treasury, Financial Management Service, Surety Bond Branch, 401 14th Street, NW, 2nd Floor, West Wing, Washington, DC 20227.

(e) Notice of subcontractor waiver of protection (40 U.S.C. 270b(c)). Any waiver of the right to sue on the payment bond is void unless it is in writing, signed by the person whose right is waived, and executed after such person has first furnished labor or material for use in the performance of the contract.

(End of clause)

**52.229-3 FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)**

(a) "Contract date," as used in this clause, means the date set for bid opening or, if this is a negotiated contract or a modification, the effective date of this contract or modification.

"All applicable Federal, State, and local taxes and duties," as used in this clause, means all taxes and duties, in effect on the contract date, that the taxing authority is imposing and collecting on the transactions or property covered by this contract.

"After-imposed Federal tax," as used in this clause, means any new or increased Federal excise tax or duty, or tax that was exempted or excluded on the contract date but whose exemption was later revoked or reduced during the contract period, on the transactions or property covered by this contract that the Contractor is required to pay or bear as the result of legislative, judicial, or administrative action taking effect after the contract date. It does not include social security tax or other employment taxes.

"After-relieved Federal tax," as used in this clause, means any amount of Federal excise tax or duty, except social security or other employment taxes, that would otherwise have been payable on the transactions or property covered by this contract, but which the Contractor is not required to pay or bear, or for which the Contractor obtains a refund or drawback, as the result of legislative, judicial, or administrative action taking effect after the contract date.

(b) The contract price includes all applicable Federal, State, and local taxes and duties.

(c) The contract price shall be increased by the amount of any after-imposed Federal tax, provided the Contractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price, as a contingency reserve or otherwise.

(d) The contract price shall be decreased by the amount of any after-relieved Federal tax.

(e) The contract price shall be decreased by the amount of any Federal excise tax or duty, except social security or other employment taxes, that the Contractor is required to pay or bear, or does not obtain a refund of, through the Contractor's fault, negligence, or failure to follow instructions of the Contracting Officer.

(f) No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceeds \$250.

(g) The Contractor shall promptly notify the Contracting Officer of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the contract price and shall take appropriate action as the Contracting Officer directs.

(h) The Government shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.

(End of clause)

**52.229-5 TAXES--CONTRACTS PERFORMED IN U.S. POSSESSIONS OR PUERTO RICO (APR 1984)**

The term "local taxes," as used in the Federal, State, and local taxes clause of this contract, includes taxes imposed by a possession of the United States or by Puerto Rico.

(End of clause)

**52.232-5 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 1997)**

(a) Payment of price. The Government shall pay the Contractor the contract price as provided in this contract.

(b) Progress payments. The Government shall make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer.

(1) The Contractor's request for progress payments shall include the following substantiation:

(i) An itemization of the amounts requested, related to the various elements of work required by the contract covered by the payment requested.

(ii) A listing of the amount included for work performed by each subcontractor under the contract.

(iii) A listing of the total amount of each subcontract under the contract.

(iv) A listing of the amounts previously paid to each such subcontractor under the contract.

(v) Additional supporting data in a form and detail required by the Contracting Officer.

(2) In the preparation of estimates, the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site also may be taken into consideration if--

(i) Consideration is specifically authorized by this contract; and

(ii) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.

(c) Contractor certification. Along with each request for progress payments, the Contractor shall furnish the following certification, or payment shall not be made: (However, if the Contractor elects to delete paragraph (c)(4) from the certification, the certification is still acceptable.)

I hereby certify, to the best of my knowledge and belief, that--

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of chapter 39 of Title 31, United States Code;

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract; and

(4) This certification is not to be construed as final acceptance of a subcontractor's performance.

---

(Name)

---

(Title)

---

(Date)

(d) Refund of unearned amounts. If the Contractor, after making a certified request for progress payments, discovers that a portion or all of such request constitutes a payment for performance by the Contractor that fails to conform to the specifications, terms, and conditions of this contract (hereinafter referred to as the "unearned amount"), the Contractor shall--

(1) Notify the Contracting Officer of such performance deficiency; and

(2) Be obligated to pay the Government an amount (computed by the Contracting Officer in the manner provided in paragraph (j) of this clause) equal to interest on the unearned amount from the 8th day after the date of receipt of the unearned amount until--

(i) The date the Contractor notifies the Contracting Officer that the performance deficiency has been corrected; or

(ii) The date the Contractor reduces the amount of any subsequent certified request for progress payments by an amount equal to the unearned amount.

(e) Retainage. If the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer shall authorize payment to be made in full. However, if satisfactory progress has not been made, the Contracting Officer may retain a maximum of 10 percent of the amount of the payment until satisfactory progress is achieved. When the work is substantially complete, the Contracting Officer may retain from previously withheld funds and future progress payments that amount the Contracting Officer considers adequate for protection of the Government and shall release to the Contractor all the remaining withheld funds. Also, on completion and acceptance of each separate building, public work, or other division of the contract, for which the price is stated separately in the contract, payment shall be made for the completed work without retention of a percentage.

(f) Title, liability, and reservation of rights. All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as--

(1) Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

(2) Waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(g) Reimbursement for bond premiums. In making these progress payments, the Government shall, upon request, reimburse the Contractor for the amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after the Contractor has furnished evidence of full payment to the surety. The retainage provisions in paragraph (e) of this clause shall not apply to that portion of progress payments attributable to bond premiums.

(h) Final payment. The Government shall pay the amount due the Contractor under this contract after--

(1) Completion and acceptance of all work;

(2) Presentation of a properly executed voucher; and

(3) Presentation of release of all claims against

the Government arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned under the Assignment of Claims Act of 1940 (31 U.S.C. 3727 and 41 U.S.C. 15).

(i) Limitation because of undefinitized work. Notwithstanding any provision of this contract, progress payments shall not exceed 80 percent on work accomplished on undefinitized contract actions. A "contract action" is any action resulting in a contract, as defined in FAR Subpart 2.1, including contract modifications for additional supplies or services, but not including contract modifications that are within the scope and under the terms of the contract, such as contract modifications issued pursuant to the Changes clause, or funding and other administrative changes.

(j) Interest computation on unearned amounts. In accordance with 31 U.S.C. 3903(c)(1), the amount payable under subparagraph (d)(2) of this clause shall be--

(1) Computed at the rate of average bond equivalent rates of 91-day Treasury bills auctioned at the most recent auction of such bills prior to the date the Contractor receives the unearned amount; and

(2) Deducted from the next available payment to the Contractor.

#### **52.232-17 INTEREST (JUNE 1996)**

(a) Except as otherwise provided in this contract under a Price Reduction for Defective Cost or Pricing Data clause or a Cost Accounting Standards clause, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code (26 U.S.C. 1481)) shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of the Treasury as provided in Section 12 of the Contract Disputes Act of 1978 (Public Law 95-563), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this clause, and then at the rate applicable for each six-month period as fixed by the Secretary until the amount is paid. reproduce, prepare derivative works, distribute copies to the public, and (b) Amounts shall be due at the earliest of the following dates:

(1) The date fixed under this contract.

(2) The date of the first written demand for payment consistent with this contract, including any demand resulting from a default termination.

(3) The date the Government transmits to the Contractor a proposed supplemental agreement to confirm completed negotiations establishing the amount of debt.

(4) If this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or a negotiated pricing agreement not confirmed by contract modification.

(c) The interest charge made under this clause may be reduced under the procedures prescribed in 32.614-2 of the Federal Acquisition Regulation in effect on the date of this contract.



**52.232-23 ASSIGNMENT OF CLAIMS (JAN 1986) - ALTERNATE I (APR 1984)**

(a) The Contractor, under the Assignment of Claims Act, as amended, 31 U.S.C. 3727, 41 U.S.C. 15 (hereafter referred to as "the Act"), may assign its rights to be paid amounts due or to become due as a result of the performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original assignment to any type of financing institution described in the preceding sentence. Unless otherwise stated in this contract, payments to an assignee of any amounts due or to become due under this contract shall not, to the extent specified in the Act, be subject to reduction or setoff.

(b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under this contract, and shall not be made to more than one party, except that an assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in the financing of this contract.

(c) The Contractor shall not furnish or disclose to any assignee under this contract any classified document (including this contract) or information related to work under this contract until the Contracting Officer authorizes such action in writing.

**52.232-27 PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (MAY 2001)**

Notwithstanding any other payment terms in this contract, the Government will make invoice payments and contract financing payments under the terms and conditions specified in this clause. Payment shall be considered as being made on the day a check is dated or the date of an electronic funds transfer. Definitions of pertinent terms are set forth in sections 2.101 and 32.902 of the Federal Acquisition Regulation. All days referred to in this clause are calendar days, unless otherwise specified. (However, see subparagraph (a)(3) concerning payments due on Saturdays, Sundays, and legal holidays.)

(a) Invoice payments. (1) Types of invoice payments. For purposes of this clause, there are several types of invoice payments that may occur under this contract, as follows:

(i) Progress payments, if provided for elsewhere in this contract, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project:

(A) The due date for making such payments shall be 14 days after receipt of the payment request by the designated billing office. If the designated billing office fails to annotate the payment request with the actual date of receipt at the time of receipt, the payment due date shall be the 14th day after the date of the Contractor's payment request, provided a proper payment request is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts, shall be as specified in the contract or, if not specified, 30 days after approval for release to the Contractor by the Contracting Officer.

(ii) Final payments based on completion and acceptance of all work and presentation of release of all claims against the Government arising by virtue of the contract, and payments for partial deliveries that have been accepted by the Government (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract):

(A) The due date for making such payments shall be either the 30th day after receipt by the designated billing office of a proper invoice from the Contractor, or the 30th day after Government acceptance of the work or services completed by the Contractor, whichever is later. If the designated billing office fails to annotate the invoice with the date of actual receipt at the time of receipt, the invoice payment due date shall be the 30th day after the date of the Contractor's invoice, provided a proper invoice is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) On a final invoice where the payment amount is subject to contract settlement actions (e.g., release of claims), acceptance shall be deemed to have occurred on the effective date of the contract settlement.

(2) Contractor's invoice. The Contractor shall prepare and submit invoices to the designated billing office specified in the contract. A proper invoice must include the items listed in subdivisions (a)(2)(i) through (a)(2)(ix) of this clause. If the invoice does not comply with these requirements, it shall be returned within 7 days after the date the designated billing office received the invoice, with a statement of the reasons why it is not a proper invoice. Untimely notification will be taken into account in computing any interest penalty owed the Contractor in the manner described in subparagraph (a)(4) of this clause.

(i) Name and address of the Contractor.

(ii) Invoice date. (The Contractor is encouraged to date invoices as close as possible to the date of mailing or transmission.)

(iii) Contract number or other authorization for work or services performed (including order number and contract line item number).

(iv) Description of work or services performed.

(v) Delivery and payment terms (e.g., prompt payment discount terms).

(vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).

(vii) Name (where practicable), title, phone number, and mailing address of person to be notified in the event of a defective invoice.

(viii) For payments described in subdivision (a)(1)(i) of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts.

(ix) Any other information or documentation required by the contract.

(x) While not required, the Contractor is strongly encouraged to assign an identification number to each invoice.

(3) Interest penalty. An interest penalty shall be paid automatically by the designated payment office, without request from the Contractor, if payment is not made by the due date and the conditions listed in subdivisions (a)(3)(i) through (a)(3)(iii) of this clause are met, if applicable. However, when the due date falls on a Saturday, Sunday, or legal holiday when Federal Government offices are closed and Government business is not expected to be conducted, payment may be made on the following business day without incurring a late payment interest penalty.

(i) A proper invoice was received by the designated billing office.

(ii) A receiving report or other Government documentation authorizing payment was processed and there was no disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.

(iii) In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(4) Computing penalty amount. The interest penalty shall be at the rate established by the Secretary of the Treasury under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) that is in effect on the day after the due date, except where the interest penalty is prescribed by other governmental authority (e.g., tariffs). This rate is referred to as the "Renegotiation Board Interest Rate," and it is published in the Federal Register semiannually on or about January 1 and July 1. The interest penalty shall accrue daily on the invoice principal payment amount approved by the Government until the payment date of such approved principal amount; and will be compounded in 30-day increments inclusive from the first day after the due date through the payment date. That is, interest accrued at the end of any 30-day period will be added to the approved invoice principal payment amount and will be subject to interest penalties if not paid in the succeeding 30-day period. If the designated billing office failed to notify the Contractor of a defective invoice within the periods prescribed in subparagraph (a)(2) of this clause, the due date on the corrected invoice will be adjusted by subtracting from such date the number of days taken beyond the prescribed notification of defects period. Any interest penalty owed the Contractor will be based on this adjusted due date. Adjustments will be made by the designated payment office for errors in calculating interest penalties.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in subdivision (a)(1)(ii) of this clause, Government acceptance or approval shall be deemed to have occurred constructively on the 7th day after the Contractor has completed the work or services in accordance with the terms and conditions of the contract. In the event that actual acceptance or approval occurs within the constructive acceptance or approval period, the determination of an interest penalty shall be based on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. These requirements also do not compel Government officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The following periods of time will not be included in the determination of an interest penalty:

(A) The period taken to notify the Contractor of defects in invoices submitted to the Government, but this may not exceed 7 days.

(B) The period between the defects notice and resubmission of the corrected invoice by the Contractor.

(C) For incorrect electronic funds transfer (EFT) information, in accordance with the EFT clause of this contract.

(iii) Interest penalties will not continue to accrue after the filing of a claim for such penalties under the clause at 52.233-1, Disputes, or for more than 1 year. Interest penalties of less than \$1 need not be paid.

(iv) Interest penalties are not required on payment delays due to disagreement between the Government and the Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. Claims involving disputes, and any interest that may be payable, will be resolved in accordance with the clause at 52.233-1, Disputes.

(5) Prompt payment discounts. An interest penalty also shall be paid automatically by the designated payment office, without request from the Contractor, if a discount for prompt payment is taken improperly. The interest penalty will be calculated on the amount of discount taken for the period beginning with the first day after the end of the discount period through the date when the Contractor is paid.

(6) Additional interest penalty. (i) If this contract was awarded on or after October 1, 1989, a penalty amount, calculated in accordance with subdivision (a)(6)(iii) of this clause, shall be paid in addition to the interest penalty amount if the Contractor--

(A) Is owed an interest penalty of \$1 or more;

(B) Is not paid the interest penalty within 10 days after the date the invoice amount is paid; and

(C) Makes a written demand to the designated payment office for additional penalty payment, in accordance with subdivision (a)(6)(ii) of this clause, postmarked not later than 40 days after the date the invoice amount is paid.

(ii)(A) Contractors shall support written demands for additional penalty payments with the following data. No additional data shall be required. Contractors shall--

(1) Specifically assert that late payment interest is due under a specific invoice, and request payment of all overdue late payment interest penalty and such additional penalty as may be required;

(2) Attach a copy of the invoice on which the unpaid late payment interest was due; and

(3) State that payment of the principal has been received, including the date of receipt.

(B) Demands must be postmarked on or before the 40th day after payment was made, except that--

(1) If the postmark is illegible or nonexistent, the demand must have been received and annotated with the date of receipt by the designated payment office on or before the 40th day after payment was made; or

(2) If the postmark is illegible or nonexistent and the designated payment office fails to make the required annotation, the demand's validity will be determined by the date the Contractor has placed on the demand; provided such date is no later than the 40th day after payment was made.

(iii)(A) The additional penalty shall be equal to 100 percent of any original late payment interest penalty, except--

(1) The additional penalty shall not exceed \$5,000;

(2) The additional penalty shall never be less than \$25; and

(3) No additional penalty is owed if the amount of the underlying interest penalty is less than \$1.

(B) If the interest penalty ceases to accrue in accordance with the limits stated in subdivision (a)(4)(iii) of this clause, the amount of the additional penalty shall be calculated on the amount of interest penalty that would have accrued in the absence of these limits, subject to the overall limits on the additional penalty specified in subdivision (a)(6)(iii)(A) of this clause.

(C) For determining the maximum and minimum additional penalties, the test shall be the interest penalty due on each separate payment made for each separate contract. The maximum and minimum additional penalty shall not be based upon individual invoices unless the invoices are paid separately. Where payments are consolidated for disbursing purposes, the maximum and minimum additional penalty determination shall be made separately for each contract therein.

(D) The additional penalty does not apply to payments regulated by other Government regulations (e.g., payments under utility contracts subject to tariffs and regulation).

(b) Contract financing payments. (1) Due dates for recurring financing payments. If this contract provides for contract financing, requests for payment shall be submitted to the designated billing office as specified in this contract or as directed by the Contracting Officer. Contract financing payments shall be made on the [insert day as prescribed by Agency head; if not prescribed, insert 30th day] day after receipt of a proper contract financing request by the designated billing office. In the event that an audit or other review of a specific financing request is required to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the due date specified.

(2) Due dates for other contract financing. For advance payments, loans, or other arrangements that do not involve recurring submissions of contract financing requests, payment shall be made in accordance with the corresponding contract terms or as directed by the Contracting Officer.

(3) Interest penalty not applicable. Contract financing payments shall not be assessed an interest penalty for payment delays.

(c) Subcontract clause requirements. The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:

(1) Prompt payment for subcontractors. A payment clause that obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.

(2) Interest for subcontractors. An interest penalty clause that obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause--

(i) For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and

(ii) Computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(3) Subcontractor clause flowdown. A clause requiring each subcontractor to include a payment clause and an interest penalty clause conforming to the standards set forth in subparagraphs (c)(1) and (c)(2) of this clause in each of its subcontracts, and to require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.

(d) Subcontract clause interpretation. The clauses required by paragraph (c) of this clause shall not be construed to impair the right of the Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions that--

(1) Retainage permitted. Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the subcontract, giving such recognition as the parties deem appropriate to the ability of a subcontractor to furnish a performance bond and a payment bond;

(2) Withholding permitted. Permit the Contractor or subcontractor to make a determination that part or all of the subcontractor's request for payment may be withheld in accordance with the subcontract agreement; and

(3) Withholding requirements. Permit such withholding without incurring any obligation to pay a late payment penalty if--

(i) A notice conforming to the standards of paragraph (g) of this clause previously has been furnished to the subcontractor; and

(ii) A copy of any notice issued by a Contractor pursuant to subdivision (d)(3)(i) of this clause has been furnished to the Contracting Officer.

(e) Subcontractor withholding procedures. If a Contractor, after making a request for payment to the Government but before making a payment to a subcontractor for the subcontractor's performance covered by the payment request, discovers that all or a portion of the payment otherwise due such subcontractor is subject to withholding from the subcontractor in accordance with the subcontract agreement, then the Contractor shall--

(1) Subcontractor notice. Furnish to the subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon ascertaining the cause giving rise to a withholding, but prior to the due date for subcontractor payment;

(2) Contracting Officer notice. Furnish to the Contracting Officer, as soon as practicable, a copy of the notice furnished to the subcontractor pursuant to subparagraph (e)(1) of this clause;

(3) Subcontractor progress payment reduction. Reduce the subcontractor's progress payment by an amount not to exceed the amount specified in the notice of withholding furnished under subparagraph (e)(1) of this clause;

(4) Subsequent subcontractor payment. Pay the subcontractor as soon as practicable after the correction of the identified subcontract performance deficiency, and--

(i) Make such payment within--

(A) Seven days after correction of the identified subcontract performance deficiency (unless the funds therefor must be recovered from the Government because of a reduction under subdivision (e)(5)(i)) of this clause; or

(B) Seven days after the Contractor recovers such funds from the Government; or

(ii) Incur an obligation to pay a late payment interest penalty computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty;

(5) Notice to Contracting Officer. Notify the Contracting Officer upon--

(i) Reduction of the amount of any subsequent certified application for payment; or

(ii) Payment to the subcontractor of any withheld amounts of a progress payment, specifying--

(A) The amounts withheld under subparagraph (e)(1) of this clause; and

(B) The dates that such withholding began and ended; and

(6) Interest to Government. Be obligated to pay to the Government an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the Government until--

(i) The day the identified subcontractor performance deficiency is corrected; or

(ii) The date that any subsequent payment is reduced under subdivision (e)(5)(i) of this clause.

(f) Third-party deficiency reports. (1) Withholding from subcontractor. If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a "second-tier subcontractor") a written notice in accordance with section 2 of the Act of August 24, 1935 (40 U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, the Contractor may, without incurring an obligation to pay an interest penalty under subparagraph (e)(6) of this clause--

(i) Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon making such determination; and

(ii) Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under subdivision (f)(1)(i) of this clause.

(2) Subsequent payment or interest charge. As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall--

(i) Pay the amount withheld under subdivision (f)(1)(ii) of this clause to such first-tier subcontractor; or

(ii) Incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(g) Written notice of subcontractor withholding. A written notice of any withholding shall be issued to a subcontractor (with a copy to the Contracting Officer of any such notice issued by the Contractor), specifying--

(1) The amount to be withheld;

(2) The specific causes for the withholding under the terms of the subcontract; and

(3) The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.

(h) Subcontractor payment entitlement. The Contractor may not request payment from the Government of any amount withheld or retained in accordance with paragraph (d) of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.

(i) Prime-subcontractor disputes. A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph (c) of this clause does not constitute a dispute to which the United States is a party. The United States may not be interpleaded in any judicial or administrative proceeding involving such a dispute.

(j) Preservation of prime-subcontractor rights. Except as provided in paragraph (i) of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or a subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.

(k) Non-recourse for prime contractor interest penalty. The Contractor's obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph (c) of this clause shall not be construed to be an obligation of the United States for such interest penalty. A cost-reimbursement claim may not include any amount for reimbursement of such interest penalty.

**52.232-33 PAYMENT BY ELECTRONIC FUNDS TRANSFER—CENTRAL CONTRACTOR  
REGISTRATION (MAY 1999)**

(a) Method of payment. (1) All payments by the Government under this contract shall be made by electronic funds transfer (EFT), except as provided in paragraph (a)(2) of this clause. As used in this clause, the term "EFT" refers to the funds transfer and may also include the payment information transfer.

(2) In the event the Government is unable to release one or more payments by EFT, the Contractor agrees to either--

(i) Accept payment by check or some other mutually agreeable method of payment; or

(ii) Request the Government to extend the payment due date until such time as the Government can make payment by EFT (but see paragraph (d) of this clause).

(b) Contractor's EFT information. The Government shall make payment to the Contractor using the EFT information contained in the Central Contractor Registration (CCR) database. In the event that the EFT information changes, the Contractor shall be responsible for providing the updated information to the CCR database.

(c) Mechanisms for EFT payment. The Government may make payment by EFT through either the Automated Clearing House (ACH) network, subject to the rules of the National Automated Clearing House Association, or the Fedwire Transfer System. The rules governing Federal payments through the ACH are contained in 31 CFR part 210.

(d) Suspension of payment. If the Contractor's EFT information in the CCR database is incorrect, then the Government need not make payment to the Contractor under this contract until correct EFT information is entered into the CCR database; and any invoice or contract financing request shall be deemed not to be a proper invoice for the purpose of prompt payment under this contract. The prompt payment terms of the contract regarding notice of an improper invoice and delays in accrual of interest penalties apply.

(e) Contractor EFT arrangements. If the Contractor has identified multiple payment receiving points (i.e., more than one remittance address and/or EFT information set) in the CCR database, and the Contractor has not notified the Government of the payment receiving point applicable to this contract, the Government shall make payment to the first payment receiving point (EFT information set or remittance address as applicable) listed in the CCR database.

(f) Liability for uncompleted or erroneous transfers. (1) If an uncompleted or erroneous transfer occurs because the Government used the Contractor's EFT information incorrectly, the Government remains responsible for--

(i) Making a correct payment;

(ii) Paying any prompt payment penalty due; and

(iii) Recovering any erroneously directed funds.

(2) If an uncompleted or erroneous transfer occurs because the Contractor's EFT information was incorrect, or was revised within 30 days of Government release of the EFT payment transaction instruction to the Federal Reserve System, and--

(i) If the funds are no longer under the control of the payment office, the Government is deemed to have made payment and the Contractor is responsible for recovery of any erroneously directed funds; or

(ii) If the funds remain under the control of the payment office, the Government shall not make payment, and the provisions of paragraph (d) of this clause shall apply.

(g) EFT and prompt payment. A payment shall be deemed to have been made in a timely manner in accordance with the prompt payment terms of this contract if, in the EFT payment transaction instruction released to the Federal Reserve System, the date specified for settlement of the payment is on or before the prompt payment due date, provided the specified payment date is a valid date under the rules of the Federal Reserve System.

(h) EFT and assignment of claims. If the Contractor assigns the proceeds of this contract as provided for in the assignment of claims terms of this contract, the Contractor shall require as a condition of any such assignment, that the assignee shall register in the CCR database and shall be paid by EFT in accordance with the terms of this clause. In all respects, the requirements of this clause shall apply to the assignee as if it were the Contractor. EFT



information that shows the ultimate recipient of the transfer to be other than the Contractor, in the absence of a proper assignment of claims acceptable to the Government, is incorrect EFT information within the meaning of paragraph (d) of this clause.

(i) Liability for change of EFT information by financial agent. The Government is not liable for errors resulting from changes to EFT information made by the Contractor's financial agent.

(j) Payment information. The payment or disbursing office shall forward to the Contractor available payment information that is suitable for transmission as of the date of release of the EFT instruction to the Federal Reserve System. The Government may request the Contractor to designate a desired format and method(s) for delivery of payment information from a list of formats and methods the payment office is capable of executing. However, the Government does not guarantee that any particular format or method of delivery is available at any particular payment office and retains the latitude to use the format and delivery method most convenient to the Government. If the Government makes payment by check in accordance with paragraph (a) of this clause, the Government shall mail the payment information to the remittance address contained in the CCR database.

(End of Clause)

#### **52.233-1 DISPUTES. (DEC 1998)**

(a) This contract is subject to the Contract Disputes Act of 1978, as amended (41 U.S.C. 601-613).

(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved under this clause.

(c) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this contract. A claim arising under a contract, unlike a claim relating to that contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. However, a written demand or written assertion by the Contractor seeking the payment of money exceeding \$100,000 is not a claim under the Act until certified as required by subparagraph (d)(2) of this clause. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under the Act. The submission may be converted to a claim under the Act, by complying with the submission and certification requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(d)(1) A claim by the Contractor shall be made in writing and, unless otherwise stated in this contract, submitted within 6 years after accrual of the claim to the Contracting Officer for a written decision. A claim by the Government against the Contractor shall be subject to a written decision by the Contracting Officer.

(2)(i) The contractors shall provide the certification specified in subparagraph (d)(2)(iii) of this clause when submitting any claim -

(A) Exceeding \$100,000; or

(B) Regardless of the amount claimed, when using -

(1) Arbitration conducted pursuant to 5 U.S.C. 575-580; or

(2) Any other alternative means of dispute resolution (ADR) technique that the agency elects to handle in accordance with the Administrative Dispute Resolution Act (ADRA).

(ii) The certification requirement does not apply to issues in controversy that have not been submitted as all or part

of a claim.

(iii) The certification shall state as follows: "I certify that the claim is made in good faith; that the supporting data are accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable; and that I am duly authorized to certify the claim on behalf of the Contractor.

(3) The certification may be executed by any person duly authorized to bind the Contractor with respect to the claim.

(e) For Contractor claims of \$100,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over \$100,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.

(f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.

(g) If the claim by the Contractor is submitted to the Contracting Officer or a claim by the Government is presented to the Contractor, the parties, by mutual consent, may agree to use alternative dispute resolution (ADR). If the Contractor refuses an offer for ADR, the Contractor shall inform the Contracting Officer, in writing, of the Contractor's specific reasons for rejecting the request.

(h) The Government shall pay interest on the amount found due and unpaid from (1) the date the Contracting Officer receives the claim (certified, if required); or (2) the date that payment otherwise would be due, if that date is later, until the date of payment. With regard to claims having defective certifications, as defined in (FAR) 48 CFR 33.201, interest shall be paid from the date that the Contracting Officer initially receives the claim. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Contracting Officer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

(i) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under the contract, and comply with any decision of the Contracting Officer.

(End of clause)

### **52.233-3 *PROTEST AFTER AWARD (AUG. 1996)***

(a) Upon receipt of a notice of protest (as defined in FAR 33.101) or a determination that a protest is likely (see FAR 33.102(d)), the Contracting Officer may, by written order to the Contractor, direct the Contractor to stop performance of the work called for by this contract. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision in the protest, the Contracting Officer shall either--

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Default, or the Termination for Convenience of the Government, clause of this contract.

(b) If a stop-work order issued under this clause is canceled either before or after a final decision in the protest, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule

or contract price, or both, and the contract shall be modified, in writing, accordingly, if--

- (1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and
- (2) The Contractor asserts its right to an adjustment within 30 days after the end of the period of work stoppage; provided, that if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon a proposal at any time before final payment under this contract.
- (c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.
- (d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.
- (e) The Government's rights to terminate this contract at any time are not affected by action taken under this clause.
- (f) If, as the result of the Contractor's intentional or negligent misstatement, misrepresentation, or miscertification, a protest related to this contract is sustained, and the Government pays costs, as provided in FAR 33.102(b)(2) or 33.104(h)(1), the Government may require the Contractor to reimburse the Government the amount of such costs. In addition to any other remedy available, and pursuant to the requirements of Subpart 32.6, the Government may collect this debt by offsetting the amount against any payment due the Contractor under any contract between the Contractor and the Government.

#### **52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984)**

The Contractor shall perform on the site, and with its own organization, work equivalent to at least twenty (20) percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

#### **52.236-2 DIFFERING SITE CONDITIONS (APR 1984)**

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of

- (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or
- (2) unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

**52.236-3 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)**

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to

(1) conditions bearing upon transportation, disposal, handling, and storage of materials;

(2) the availability of labor, water, electric power, and roads;

(3) uncertainties of weather, river stages, tides, or similar physical conditions at the site;

(4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Government.

(b) The Government assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Government. Nor does the Government assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

**52.236-4 PHYSICAL DATA (APR 1984)**

Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

(a) The indications of physical conditions on the drawings and in the specifications are the result of site investigations by surveys, soil borings, and historic data.

(b) Weather conditions: Bidders should satisfy themselves before submitting bids as to hazards from weather conditions. Complete weather records and reports may be obtained from the local U.S. Weather Service.

(c) Transportation facilities: Bidders should satisfy themselves before submitting bids as to transportation facilities available.

(d) N/A

**52.236-5 MATERIAL AND WORKMANSHIP (APR 1984)**

(a) All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(c) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

**52.236-6 SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)**

At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the worksite a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

**52.236-7 PERMITS AND RESPONSIBILITIES (NOV 1991)**

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, State, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

**52.236-8 OTHER CONTRACTS (APR 1984)**

The Government may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with Government employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by Government employees.

**52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)**

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(b) The Contractor shall protect from damage all existing improvements and utilities

(1) at or near the work site, and

(2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

**52.236-10 OPERATIONS AND STORAGE AREAS (APR 1984)**

(a) The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

(b) Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation.

When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

**52.236-11 USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)**

(a) The Government shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Government intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Government's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the Government has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the Government's possession or use, notwithstanding the terms of the clause in this contract entitled "Permits and Responsibilities." If prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

**52.236-12 CLEANING UP (APR 1984)**

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any rubbish, tools, scaffolding, equipment, and materials that are not the property of the Government. Upon completing the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer.

**52.236-13 ACCIDENT PREVENTION (NOV 1991) – ALTERNATE I (NOV 1991)**

(a) The Contractor shall provide and maintain work environments and procedures which will

(1) safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities;

(2) avoid interruptions of Government operations and delays in project completion dates; and

(3) control costs in the performance of this contract.

(b) For these purposes on contracts for construction or dismantling, demolition, or removal of improvements, the Contractor shall-

(1) Provide appropriate safety barricades, signs, and signal lights;

(2) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and

(3) Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for the

purposes are taken.

(c) If this contract is for construction or dismantling, demolition or removal of improvements with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the latest version of U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, in effect on the date of the solicitation.

(d) Whenever the Contracting Officer becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public or Government personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. This notice, when delivered to the Contractor or the Contractor's representative at the work site, shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.

(e) The Contractor shall insert this clause, including this paragraph (e), with appropriate changes in the designation of the parties, in subcontracts.

(f) Before commencing the work, the Contractor shall-

(1) Submit a written proposed plan for implementing this clause. The plan shall include an analysis of the significant hazards to life, limb, and property inherent in contract work performance and a plan for controlling these hazards; and

(2) Meet with representatives of the Contracting Officer to discuss and develop a mutual understanding relative to administration of the overall safety program.

#### **52.236-17 LAYOUT OF WORK (APR 1984)**

The Contractor shall lay out its work from Government established base lines and bench marks indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through its negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

#### **52.236-21 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997)**

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the



Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by," or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown," "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place," that is "furnished and installed".

(d) Shop drawings means drawings, submitted to the Government by the Contractor, subcontractor, or any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements, and (2) the installation (i.e., fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the contractor to explain in detail specific portions of the work required by the contract. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the Contracting Officer and one set will be returned to the Contractor.

#### **52.236-26 PRECONSTRUCTION CONFERENCE (FEB 1995)**

If the Contracting Officer decides to conduct a preconstruction conference, the successful offeror will be notified and will be required to attend. The Contracting Officer's notification will include specific details regarding the date, time, and location of the conference, any need for attendance by subcontractors, and information regarding the items to be discussed.

**52.242-13    *BANKRUPTCY (JUL 1995)***

In the event the Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary, the Contractor agrees to furnish, by certified mail or electronic commerce method authorized by the contract, written notification of the bankruptcy to the Contracting Officer responsible for administering the contract. This notification shall be furnished within five days of the initiation of the proceedings relating to bankruptcy filing. This notification shall include the date on which the bankruptcy petition was filed, the identity of the court in which the bankruptcy petition was filed, and a listing of Government contract numbers and contracting offices for all Government contracts against which final payment has not been made. This obligation remains in effect until final payment under this contract.

(End of clause)

**52.243-4    *CHANGES (AUG 1987)***

(a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes--

- (1) In the specifications (including drawings and designs);
- (2) In the method or manner of performance of the work;
- (3) In the Government-furnished facilities, equipment, materials, services, or site; or
- (4) Directing acceleration in the performance of the work.

(b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating

- (1) the date, circumstances, and source of the order and
- (2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under paragraph (b) of this clause shall be made for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after

- (1) receipt of a written change order under paragraph (a) of this clause or (2) the furnishing of a written notice under

paragraph (b) of this clause, by submitting to the Contracting Officer a written statement describing the general nature and amount of the proposal, unless this period is extended by the Government. The statement of proposal for adjustment may be included in the notice under paragraph (b) above.

(f) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

#### **52.244-6 SUBCONTRACTS FOR COMMERCIAL ITEMS (DEC 2001)**

(a) Definitions. As used this clause--

"Commercial item", has the meaning contained in the clause at 52.202-1, Definitions.

"Subcontract", includes a transfer of commercial items between divisions, subsidiaries, or affiliates of the Contractor or subcontractor at any tier.

(b) To the maximum extent practicable, the Contractor shall incorporate, and require its subcontractors at all tiers to incorporate, commercial items or nondevelopmental items as components of items to be supplied under this contract.

(c)(1) The Contractor shall insert the following clauses in subcontracts for commercial items:

(i) 52.219-8, Utilization of Small Business Concerns (OCT 2000) (15 U.S.C. 637(d)(2) and (3)), in all subcontracts that offer further subcontracting opportunities. If the subcontract (except subcontracts to small business concerns) exceeds \$500,000 (\$1,000,000 for construction of any public facility), the subcontractor must include 52.219-8 in lower tier subcontracts that offer subcontracting opportunities.

(ii) 52.222-26, Equal Opportunity (FEB 1999) (E.O. 11246).

(iii) 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era and Other Eligible Veterans (DEC 2001) (38 U.S.C. 4212(a)).

(iv) 52.222-36, Affirmative Action for Workers with Disabilities (JUN 1998) (29 U.S.C. 793).

(v) 52.247-64, Preference for Privately Owned U.S.-Flagged Commercial Vessels (JUN 2000) (46 U.S.C. Appx 1241) (flowdown not required for subcontracts awarded beginning May 1, 1996).

(2) While not required, the Contractor may flow down to subcontracts for commercial items a minimal number of additional clauses necessary to satisfy its contractual obligations.

(d) The Contractor shall include the terms of this clause, including this paragraph (d), in subcontracts awarded under this contract.

#### **52.245-1 PROPERTY RECORDS (APR 1984)**

The Government shall maintain the Government's official property records in connection with Government property under this contract. The Government Property clause is hereby modified by deleting the requirement for the Contractor to maintain such records.

**52.245-2 GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS) (DEC 1989)**

(a) Government-furnished property. (1) The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the Government-furnished property described in the Schedule or specifications together with any related data and information that the Contractor may request and is reasonably required for the intended use of the property (hereinafter referred to as "Government-furnished property").

(2) The delivery or performance dates for this contract are based upon the expectation that Government-furnished property suitable for use (except for property furnished "as is") will be delivered to the Contractor at the times stated in the Schedule or, if not so stated, in sufficient time to enable the Contractor to meet the contract's delivery or performance dates.

(3) If Government-furnished property is received by the Contractor in a condition not suitable for the intended use, the Contractor shall, upon receipt of it, notify the Contracting Officer, detailing the facts, and, as directed by the Contracting Officer and at Government expense, either repair, modify, return, or otherwise dispose of the property. After completing the directed action and upon written request of the Contractor, the Contracting Officer shall make an equitable adjustment as provided in paragraph (h) of this clause.

(4) If Government-furnished property is not delivered to the Contractor by the required time, the Contracting Officer shall, upon the Contractor's timely written request, make a determination of the delay, if any, caused the Contractor and shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(b) Changes in Government-furnished property. (1) The Contracting Officer may, by written notice, (i) decrease the Government-furnished property provided or to be provided under this contract, or (ii) substitute other Government-furnished property for the property to be provided by the Government, or to be acquired by the Contractor for the Government, under this contract. The Contractor shall promptly take such action as the Contracting Officer may direct regarding the removal, shipment, or disposal of the property covered by such notice.

(2) Upon the Contractor's written request, the Contracting Officer shall make an equitable adjustment to the contract in accordance with paragraph (h) of this clause, if the Government has agreed in the Schedule to make the property available for performing this contract and there is any--

(i) Decrease or substitution in this property pursuant to subparagraph (b)(1) of this clause; or

(ii) Withdrawal of authority to use this property, if provided under any other contract or lease.

(c) Title in Government property. (1) The Government shall retain title to all Government-furnished property.

(2) All Government-furnished property and all property acquired by the Contractor, title to which vests in the Government under this paragraph (collectively referred to as "Government property"), are subject to the provisions of this clause. However, special tooling accountable to this contract is subject to the provisions of the Special Tooling clause and is not subject to the provisions of this clause. Title to Government property shall not be affected by its incorporation into or attachment to any property not owned by the Government, nor shall Government property become a fixture or lose its identity as personal property by being attached to any real property.

(3) Title to each item of facilities and special test equipment acquired by the Contractor for the Government under this contract shall pass to and vest in the Government when its use in performing this contract commences or when the Government has paid for it, whichever is earlier, whether or not title previously vested in the Government.

(4) If this contract contains a provision directing the Contractor to purchase material for which the Government will reimburse the Contractor as a direct item of cost under this contract--

- (i) Title to material purchased from a vendor shall pass to and vest in the Government upon the vendor's delivery of such material; and
- (ii) Title to all other material shall pass to and vest in the Government upon--
  - (A) Issuance of the material for use in contract performance;
  - (B) Commencement of processing of the material or its use in contract performance; or
  - (C) Reimbursement of the cost of the material by the Government, whichever occurs first.
- (d) Use of Government property. The Government property shall be used only for performing this contract, unless otherwise provided in this contract or approved by the Contracting Officer.
- (e) Property administration. (1) The Contractor shall be responsible and accountable for all Government property provided under this contract and shall comply with Federal Acquisition Regulation (FAR) Subpart 45.5, as in effect on the date of this contract.  
  
(2) The Contractor shall establish and maintain a program for the use, maintenance, repair, protection, and preservation of Government property in accordance with sound industrial practice and the applicable provisions of Subpart 45.5 of the FAR.  
  
(3) If damage occurs to Government property, the risk of which has been assumed by the Government under this contract, the Government shall replace the items or the Contractor shall make such repairs as the Government directs. However, if the Contractor cannot effect such repairs within the time required, the Contractor shall dispose of the property as directed by the Contracting Officer. When any property for which the Government is responsible is replaced or repaired, the Contracting Officer shall make an equitable adjustment in accordance with paragraph (h) of this clause.  
  
(4) The Contractor represents that the contract price does not include any amount for repairs or replacement for which the Government is responsible. Repair or replacement of property for which the Contractor is responsible shall be accomplished by the Contractor at its own expense.
- (f) Access. The Government and all its designees shall have access at all reasonable times to the premises in which any Government property is located for the purpose of inspecting the Government property.
- (g) Risk of loss. Unless otherwise provided in this contract, the Contractor assumes the risk of, and shall be responsible for, any loss or destruction of, or damage to, Government property upon its delivery to the Contractor or upon passage of title to the Government under paragraph (c) of this clause. However, the Contractor is not responsible for reasonable wear and tear to Government property or for Government property properly consumed in performing this contract.
- (h) Equitable adjustment. When this clause specifies an equitable adjustment, it shall be made to any affected contract provision in accordance with the procedures of the Changes clause. When appropriate, the Contracting Officer may initiate an equitable adjustment in favor of the Government. The right to an equitable adjustment shall be the Contractor's exclusive remedy. The Government shall not be liable to suit for breach of contract for--
  - (1) Any delay in delivery of Government-furnished property;
  - (2) Delivery of Government-furnished property in a condition not suitable for its intended use;
  - (3) A decrease in or substitution of Government-furnished property; or
  - (4) Failure to repair or replace Government property for which the Government is responsible.

(i) Final accounting and disposition of Government property. Upon completing this contract, or at such earlier dates as may be fixed by the Contracting Officer, the Contractor shall submit, in a form acceptable to the Contracting Officer, inventory schedules covering all items of Government property (including any resulting scrap) not consumed in performing this contract or delivered to the Government. The Contractor shall prepare for shipment, deliver f.o.b. origin, or dispose of the Government property as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid to the Government as the Contracting Officer directs.

(j) Abandonment and restoration of Contractor's premises. Unless otherwise provided herein, the Government--

(1) May abandon any Government property in place, at which time all obligations of the Government regarding such abandoned property shall cease; and

(2) Has no obligation to restore or rehabilitate the Contractor's premises under any circumstances (e.g., abandonment, disposition upon completion of need, or upon contract completion). However, if the Government-furnished property (listed in the Schedule or specifications) is withdrawn or is unsuitable for the intended use, or if other Government property is substituted, then the equitable adjustment under paragraph (h) of this clause may properly include restoration or rehabilitation costs.

(k) Communications. All communications under this clause shall be in writing.

(l) Overseas contracts. If this contract is to be performed outside of the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished," respectively.

(End of clause)

#### **52.246-21 WARRANTY OF CONSTRUCTION (MAR 1994)**

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (i) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(c) The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(e) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

(h) In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

(j) This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

(End of clause)

### **52.248-3 VALUE ENGINEERING--CONSTRUCTION (FEB 2000)**

(a) General. The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECP's) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECP's, in accordance with paragraph (f) below.

(b) Definitions. "Collateral costs," as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.

"Collateral savings," as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exclusive of acquisition savings, whether or not the acquisition cost changes.

"Contractor's development and implementation costs," as used in this clause, means those costs the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the contractual changes required by Government acceptance of a VECP.

"Government costs," as used in this clause, means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.

"Instant contract savings," as used in this clause, means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) below).

"Value engineering change proposal (VECP)" means a proposal that--

- (1) Requires a change to this, the instant contract, to implement; and
  - (2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics; provided, that it does not involve a change--
    - (i) In deliverable end item quantities only; or
    - (ii) To the contract type only.
- (c) VECP preparation. As a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through (7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:
- (1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.
  - (2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.
  - (3) A separate, detailed cost estimate for
    - (i) the affected portions of the existing contract requirement and
    - (ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) below.
  - (4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.
  - (5) A prediction of any effects the proposed change would have on collateral costs to the agency.
  - (6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.
  - (7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.
- (d) Submission. The Contractor shall submit VECP's to the Resident Engineer at the worksite, with a copy to the Contracting Officer.
- (e) Government action.
- (1) The Contracting Officer will notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required, the Contracting Officer will notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The Government will process VECP's expeditiously; however, it shall not be liable for any delay in acting upon a VECP.



If the VECP is not accepted, the Contracting Officer will notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The decision to accept or reject all or part of any VECP is a unilateral decision made solely at the discretion of the Contracting Officer.

(f) Sharing.

(1) Rates. The Government's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by

(i) 45 percent for fixed-price contracts or

(ii) 75 percent for cost-reimbursement contracts.

(2) Payment. Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to--

(i) Accept the VECP;

(ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(iii) Provide the Contractor's share of savings by adding the amount calculated to the contract price or fee.

(g) Collateral savings. If a VECP is accepted, the Contracting Officer will increase the instant contract amount by 20 percent of any projected collateral savings determined to be realized in a typical year of use after subtracting any Government costs not previously offset. However, the Contractor's share of collateral savings will not exceed the contract's firm-fixed-price or estimated cost, at the time the VECP is accepted, or \$100,000, whichever is greater. The Contracting Officer is the sole determiner of the amount of collateral savings.

(h) Subcontracts. The Contractor shall include an appropriate value engineering clause in any subcontract of \$50,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) above, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments; provided, that these payments shall not reduce the Government's share of the savings resulting from the VECP.

(i) Data. The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

"These data, furnished under the Value Engineering-- Construction clause of contract . . . . ., shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations." If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract

modification implementing the VECF and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in Part 27 of the Federal Acquisition Regulation.)

(End of clause)

**52.249-2 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SEP 1996) -  
ALTERNATE I (SEP 1996)**

(a) The Government may terminate performance of work under this contract in whole or, from time to time, in part if the Contracting Officer determines that a termination is in the Government's interest. The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying the extent of termination and the effective date.

(b) After receipt of a Notice of Termination, and except as directed by the Contracting Officer, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

(1) Stop work as specified in the notice.

(2) Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete the continued portion of the contract.

(3) Terminate all subcontracts to the extent they relate to the work terminated.

(4) Assign to the Government, as directed by the Contracting Officer, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the Contracting Officer, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this clause.

(6) As directed by the Contracting Officer, transfer title and deliver to the Government (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (ii) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the Government.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (b)(6) of this clause; provided, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.

(c) The Contractor shall submit complete termination inventory schedules no later than 120 days from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 120-day period.

(d) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor may request the Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept title to those items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(e) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 1-year period. However, if the Contracting Officer determines that the facts justify it, a termination settlement proposal may be received and acted on after 1 year or any extension. If the Contractor fails to submit the proposal within the time allowed, the Contracting Officer may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.

(f) Subject to paragraph (e) of this clause, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount to be paid or remaining to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (g) or paragraph (g) of this clause, exclusive of costs shown in subparagraph (g)(3) of this clause, may not exceed the total contract price as reduced by (1) the amount of payments previously made and (2) the contract price of work not terminated. The contract shall be modified, and the Contractor paid the agreed amount. Paragraph (g) of this clause shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.

(g) If the Contractor and Contracting Officer fail to agree on the whole amount to be paid the Contractor because of the termination of work, the Contracting Officer shall pay the Contractor the amounts determined as follows, but without duplication of any amounts agreed upon under paragraph (f) of this clause:

(1) For contract work performed before the effective date of termination, the total (without duplication of any items) of--

(i) The cost of this work;

(ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (g)(1)(i) of this clause; and

(iii) A sum, as profit on subdivision (g)(1)(i) of this clause, determined by the Contracting Officer under 49.202 of the Federal Acquisition Regulation, in effect on the date of this contract, to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the Contracting Officer shall allow no profit under this subdivision (iii) and shall reduce the settlement to reflect the indicated rate of loss.

(2) The reasonable costs of settlement of the work terminated, including--

(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

(h) Except for normal spoilage, and except to the extent that the Government expressly assumed the risk of loss, the Contracting Officer shall exclude from the amounts payable to the Contractor under paragraph (g) of this clause, the fair value, as determined by the Contracting Officer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government or to a buyer.

(i) The cost principles and procedures of Part 31 of the Federal Acquisition Regulation, in effect on the date of this contract, shall govern all costs claimed, agreed to, or determined under this clause.

(j) The Contractor shall have the right of appeal, under the Disputes clause, from any determination made by the Contracting Officer under paragraph (e), (g), or (l) of this clause, except that if the Contractor failed to submit the termination settlement proposal or request for equitable adjustment within the time provided in paragraph (e) or (l), respectively, and failed to request a time extension, there is no right of appeal.

(k) In arriving at the amount due the Contractor under this clause, there shall be deducted--

(1) All unliquidated advance or other payments to the Contractor under the terminated portion of this contract;

(2) Any claim which the Government has against the Contractor under this contract; and

(3) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the Government.

(l) If the termination is partial, the Contractor may file a proposal with the Contracting Officer for an equitable adjustment of the price(s) of the continued portion of the contract. The Contracting Officer shall make any equitable adjustment agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within 90 days from the effective date of termination unless extended in writing by the Contracting Officer.

(m)(1) The Government may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Contracting Officer believes the total of these payments will not exceed the amount to which the Contractor will be entitled.

(2) If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215(b)(2). Interest shall be computed for the period from the date the excess payment is received by the Contractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Contractor's termination settlement proposal because of retention or other disposition of termination inventory until 10 days after the date of the retention or disposition, or a later date determined by the Contracting Officer because of the circumstances.

(n) Unless otherwise provided in this contract or by statute, the Contractor shall maintain all records and documents relating to the terminated portion of this contract for 3 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this contract. The Contractor shall make these records and documents available to the Government, at the Contractor's office, at all reasonable times, without any direct charge. If approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

**52.249-10 DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)**

(a) If the Contractor refuses or fails to prosecute the work or any separable part, with the diligence that will insure its completion within the time specified in this contract including any extension, or fails to complete the work within this time, the Government may, by written notice to the Contractor, terminate the right to proceed with the work (or the separable part of the work) that has been delayed. In this event, the Government may take over the work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the Government resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the Government in completing the work.

(b) The Contractor's right to proceed shall not be terminated nor the Contractor charged with damages under this clause, if--

(1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include

(i) acts of God or of the public enemy,

(ii) acts of the Government in either its sovereign or contractual capacity,

(iii) acts of another Contractor in the performance of a contract with the Government,

(iv) fires,

(v) floods,

(vi) epidemics,

(vii) quarantine restrictions,

(viii) strikes,

(ix) freight embargoes,

(x) unusually severe weather, or delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any delay (unless extended by the Contracting Officer), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, the time for completing the work shall be extended. The findings of the Contracting Officer shall be final and conclusive on the parties, but subject to appeal under the Disputes clause.

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of the Government.

The rights and remedies of the Government in this clause are in addition to any other rights and remedies provided by law or under this contract.

**52.253-1 COMPUTER GENERATED FORMS (JAN 1991)**

- (a) Any data required to be submitted on a Standard or Optional Form prescribed by the Federal Acquisition Regulation (FAR) may be submitted on a computer generated version of the form, provided there is no change to the name, content, or sequence of the data elements on the form, and provided the form carries the Standard or Optional Form number and edition date.
- (b) Unless prohibited by agency regulations, any data required to be submitted on an agency unique form prescribed by an agency supplement to the FAR may be submitted on a computer generated version of the form provided there is no change to the name, content, or sequence of the data elements on the form and provided the form carries the agency form number and edition date.
- (c) If the Contractor submits a computer generated version of a form that is different than the required form, then the rights and obligations of the parties will be determined based on the content of the required form.

**252.201-7000 CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)**

- (a) "Definition. Contracting officer's representative" means an individual designated in accordance with subsection 201.602-2 of the Defense Federal Acquisition Regulation Supplement and authorized in writing by the contracting officer to perform specific technical or administrative functions.
- (b) If the Contracting Officer designates a contracting officer's representative (COR), the Contractor will receive a copy of the written designation. It will specify the extent of the COR's authority to act on behalf of the contracting officer. The COR is not authorized to make any commitments or changes that will affect price, quality, quantity, delivery, or any other term or condition of the contract.

(End of clause)

**252.203-7001 PROHIBITION ON PERSONS CONVICTED OF FRAUD OR OTHER DEFENSE-  
CONTRACT-RELATED FELONIES (MAR 1999)**

- (a) Definitions. As used in this clause—
  - (1) "Arising out of a contract with the DoD" means any act in connection with—
    - (i) Attempting to obtain;
    - (ii) Obtaining, or
    - (iii) Performing a contract or first-tier subcontract of any agency, department, or component of the Department of Defense (DoD).

(2) "Conviction of fraud or any other felony" means any conviction for fraud or a felony in violation of state or Federal criminal statutes, whether entered on a verdict or plea, including a plea of *nolo contendere*, for which sentence has been imposed.

(3) "Date of conviction" means the date judgment was entered against the individual.

(b) Any individual who is convicted after September 29, 1988, of fraud or any other felony arising out of a contract with the DoD is prohibited from serving--

(1) In a management or supervisory capacity on any DoD contract or first-tier subcontract;

(2) On the board of directors of any DoD contractor or first-tier subcontractor;

(3) As a consultant, agent, or representative for any DoD contractor or first-tier subcontractor; or

(4) In any other capacity with the authority to influence, advise, or control the decisions of any DoD contractor or subcontractor with regard to any DoD contract or first-tier subcontract.

(c) Unless waived, the prohibition in paragraph (b) of this clause applies for not less than 5 years from the date of conviction.

(d) 10 U.S.C. 2408 provides that a defense contractor or first-tier subcontractor shall be subject to a criminal penalty of not more than \$500,000 if convicted of knowingly—

(1) Employing a person under a prohibition specified in paragraph (b) of this clause; or

(2) Allowing such a person to serve on the board of directors of the contractor or first-tier subcontractor.

(e) In addition to the criminal penalties contained in 10 U.S.C. 2408, the Government may consider other available remedies, such as—

(1) Suspension or debarment;

(2) Cancellation of the contract at no cost to the Government; or

(3) Termination of the contract for default.

(f) The Contractor may submit written requests for waiver of the prohibition in paragraph (b) of this clause to the Contracting Officer. Requests shall clearly identify—

(1) The person involved;

(2) The nature of the conviction and resultant sentence or punishment imposed;

(3) The reasons for the requested waiver; and

(4) An explanation of why a waiver is in the interest of national security.

(g) The Contractor agrees to include the substance of this clause, appropriately modified to reflect the identity and relationship of the parties, in all first-tier subcontracts exceeding the simplified acquisition threshold in Part 2 of the Federal Acquisition Regulation, except those for commercial items or components.

(h) Pursuant to 10 U.S.C. 2408(c), defense contractors and subcontractors may obtain information as to whether a particular person has been convicted of fraud or any other felony arising out of a contract with the DoD by contacting The Office of Justice Programs, The Denial of Federal Benefits Office, U.S. Department of Justice, telephone (202) 616-3507.

(End of clause)

**252.203-7002 DISPLAY OF DOD HOTLINE POSTER (DEC 1991)**

(a) The Contractor shall display prominently in common work areas within business segments performing work under Department of Defense (DoD) contracts, DoD Hotline Posters prepared by the DoD Office of the Inspector General.

(b) DoD Hotline Posters may be obtained from the DoD Inspector General, ATTN: Defense Hotline, 400 Army Navy Drive, Washington, DC 22202-2884.

(c) The Contractor need not comply with paragraph (a) of this clause if it has established a mechanism, such as a hotline, by which employees may report suspected instances of improper conduct, and instructions that encourage employees to make such reports.

(End of clause)

**252.204-7000 DISCLOSURE OF INFORMATION (DEC 1991)**

(a) The Contractor shall not release to anyone outside the Contractor's organization any unclassified information, regardless of medium (e.g., film, tape, document), pertaining to any part of this contract or any program related to this contract, unless--

(1) The Contracting Officer has given prior written approval; or

(2) The information is otherwise in the public domain before the date of release.

(b) Requests for approval shall identify the specific information to be released, the medium to be used, and the purpose for the release. The Contractor shall submit its request to the Contracting Officer at least 45 days before the proposed date for release.

(c) The Contractor agrees to include a similar requirement in each subcontract under this contract. Subcontractors shall submit requests for authorization to release through the prime contractor to the Contracting Officer.

(End of clause)

**252.204-7003 CONTROL OF GOVERNMENT PERSONNEL WORK PRODUCT (APR 1992)**

The Contractor's procedures for protecting against unauthorized disclosure of information shall not require Department of Defense employees or members of the Armed Forces to relinquish control of their work products, whether classified or not, to the contractor.



(End of clause)

**252.204-7004 REQUIRED CENTRAL CONTRACTOR REGISTRATION.(NOV 2001)**

(a) Definitions.

As used in this clause--

(1) Central Contractor Registration (CCR) database means the primary DoD repository for contractor information required for the conduct of business with DoD.

(2) Data Universal Numbering System (DUNS) number means the 9-digit number assigned by Dun and Bradstreet Information Services to identify unique business entities.

(3) Data Universal Numbering System +4 (DUNS+4) number means the DUNS number assigned by Dun and Bradstreet plus a 4-digit suffix that may be assigned by a parent (controlling) business concern. This 4-digit suffix may be assigned at the discretion of the parent business concern for such purposes as identifying subunits or affiliates of the parent business concern.

(4) Registered in the CCR database means that all mandatory information, including the DUNS number or the DUNS+4 number, if applicable, and the corresponding Commercial and Government Entity (CAGE) code, is in the CCR database; the DUNS number and the CAGE code have been validated; and all edits have been successfully completed.

(b)(1) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee must be registered in the CCR database prior to award, during performance, and through final payment of any contract resulting from this solicitation, except for awards to foreign vendors for work to be performed outside the United States.

(2) The offeror shall provide its DUNS or, if applicable, its DUNS+4 number with its offer, which will be used by the Contracting Officer to verify that the offeror is registered in the CCR database.

(3) Lack of registration in the CCR database will make an offeror ineligible for award.

(4) DoD has established a goal of registering an applicant in the CCR database within 48 hours after receipt of a complete and accurate application via the Internet. However, registration of an applicant submitting an application through a method other than the Internet may take up to 30 days. Therefore, offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation.

(c) The Contractor is responsible for the accuracy and completeness of the data within the CCR, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the CCR database after the initial registration, the Contractor is required to confirm on an annual basis that its information in the CCR database is accurate and complete.

(d) Offerors and contractors may obtain information on registration and annual confirmation requirements by calling 1-888-227-2423, or via the Internet at <http://www.ccr.gov>.

(End of clause)

**252.205-7000 PROVISION OF INFORMATION TO COOPERATIVE AGREEMENT HOLDERS (DEC 1991)**

(a) Definition.

"Cooperative agreement holder" means a State or local government; a private, nonprofit organization; a tribal organization (as defined in section 4(c) of the Indian Self-Determination and Education Assistance Act (Pub. L. 93-268; 25 U.S.C. 450 (c))); or an economic enterprise (as defined in section 3(e) of the Indian Financing Act of 1974 (Pub. L. 93-362; 25 U.S.C. 1452(e))) whether such economic enterprise is organized for profit or nonprofit purposes; which has an agreement with the Defense Logistics Agency to furnish procurement technical assistance to business entities.

(b) The Contractor shall provide cooperative agreement holders, upon their request, with a list of those appropriate employees or offices responsible for entering into subcontracts under defense contracts. The list shall include the business address, telephone number, and area of responsibility of each employee or office.

(c) The Contractor need not provide the listing to a particular cooperative agreement holder more frequently than once a year.

(End of clause)

**252.209-7000 ACQUISITION FROM SUBCONTRACTORS SUBJECT TO ONSITE INSPECTION UNDER THE INTERMEDIATE-RANGE NUCLEAR FORCES (INF) TREATY (NOV 1995)**

(a) The Contractor shall not deny consideration for a subcontract award under this contract to a potential subcontractor subject to on-site inspection under the INF Treaty, or a similar treaty, solely or in part because of the actual or potential presence of Soviet inspectors at the subcontractor's facility, unless the decision is approved by the Contracting Officer.

(b) The Contractor shall incorporate this clause, including this paragraph (b), in all solicitations and contracts exceeding the simplified acquisition threshold in part 13 of the Federal Acquisition Regulation, except those for commercial items.

**252.209-7003 COMPLIANCE WITH VETERANS' EMPLOYMENT REPORTING REQUIREMENTS (MAR 1998)**

By submission of its offer, the offeror represents that, if it is subject to the reporting requirements of 37 U.S.C. 4212(d) (i.e., the VETS-100 report required by Federal Acquisition Regulation clause 52.222-37, Employment Reports on Disabled Veterans and Veterans of the Vietnam Era), it has submitted the most recent report required by 38 U.S.C. 4212(d).

**252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)**

(a) Unless the Government determines that there is a compelling reason to do so, the Contractor shall not enter into any subcontract in excess of \$25,000 with a firm, or subsidiary of a firm, that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country.

(b) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country. The notice must include the name of the proposed subcontractor notwithstanding its inclusion on the List of Parties Excluded From Federal Procurement and Nonprocurement Programs.

**252.219-7003 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (DOD CONTRACTS) (APR. 1996)**

This clause supplements the Federal Acquisition Regulation 52.219-9, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan, clause of this contract.

(a) *Definitions. Historically black colleges and universities*, as used in this clause, means institutions determined by the Secretary of Education to meet the requirements of 34 CFR 608.2. The term also means any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

*Minority institutions*, as used in this clause, means institutions meeting the requirements of section 1046(3) of the Higher Education Act of 1965 (20 U.S.C. 1135d-5(3)). The term also includes Hispanic-serving institutions as defined in section 316(b)(1) of such Act (20 U.S.C. 1059c(b)(1)).

(b) Except for company or division-wide commercial items subcontracting plans, the term *small disadvantaged business*, when used in the FAR 52.219-9 clause, includes historically black colleges and universities and minority institutions, in addition to small disadvantaged business concerns.

(c) Work under the contract or its subcontracts shall be credited toward meeting the small disadvantaged business concern goal required by paragraph (d) of the FAR 52.219-9 clause when:

- (1) It is performed on Indian lands or in joint venture with an Indian tribe or a tribally-owned corporation, and
- (2) It meets the requirements of 10 U.S.C. 2323a.

(d) Subcontracts awarded to workshops approved by the Committee for Purchase from People Who are Blind or Severely Disabled (41 U.S.C. 46-48), may be counted toward the Contractor's small business subcontracting goal.

(e) A mentor firm, under the Pilot Mentor-Protege Program established under Section 831 of Pub. L. 101-510, as amended, may count toward its small disadvantaged business goal, subcontracts awarded--

(f) The master plan approval referred to in paragraph (f) of the FAR 52.219-9 clause is approval by the Contractor's cognizant contract administration activity.

(g) In those subcontracting plans which specifically identify small, small disadvantaged, and women-owned small businesses, the Contractor shall notify the Administrative Contracting Officer of any substitutions of firms that are not small, small disadvantaged, or women-owned small businesses for the firms listed in the subcontracting plan. Notifications shall be in writing and shall occur within a reasonable period of time after award of the subcontract. Contractor-specified formats shall be acceptable.

(End of clause)

**252.223-7006 PROHIBITION ON STORAGE AND DISPOSAL OF TOXIC AND HAZARDOUS MATERIALS (APR 1993)**

(a) "Definitions".

As used in this clause --

(1) "Storage" means a non-transitory, semi-permanent or permanent holding, placement, or leaving of material. It does not include a temporary accumulation of a limited quantity of a material used in or a waste generated or resulting from authorized activities, such as servicing, maintenance, or repair of Department of Defense (DoD) items, equipment, or facilities.

(2) "Toxic or hazardous materials" means:

(i) Materials referred to in section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9601(14)) and materials designated under section 102 of CERCLA (42 U.S.C. 9602) (40 CFR part 302);

(ii) Materials that are of an explosive, flammable, or pyrotechnic nature; or

(iii) Materials otherwise identified by the Secretary of Defense as specified in DoD regulations.

(b) In accordance with 10 U.S.C. 2692, the Contractor is prohibited from storing or disposing of non-DoD-owned toxic or hazardous materials on a DoD installation, except to the extent authorized by a statutory exception to 10 U.S.C. 2692 or as authorized by the Secretary of Defense or his designee.

(End of clause)

**252.225-7012 PREFERENCE FOR CERTAIN DOMESTIC COMMODITIES (AUG 2000)**

(a) The Contractor agrees to deliver under this contract only such of the following articles that have been grown, reprocessed, reused, or produced in the United States, its possessions, or Puerto Rico --

(1) Food;

(2) Clothing;

(3) Tents, tarpaulins, or covers;

(4) Cotton and other natural fiber products;

(5) Woven silk or woven silk blends;

- (6) Spun silk yarn for cartridge cloth;
  - (7) Synthetic fabric, and coated synthetic fabric, including all textile fibers and yarns that are for use in such fabrics;
  - (8) Canvas products;
  - (9) Wool (whether in the form of fiber or yarn or contained in fabrics, materials, or manufactured articles); or
  - (10) Any item of individual equipment (Federal supply Classification 8465) manufactured from or containing such fibers, yarns, fabrics, or materials.
  - (b) This clause does not apply --
    - (1) To supplies listed in FAR section 25.104(a), or other supplies for which the Government has determined that a satisfactory quality and sufficient quantity cannot be acquired as and when needed at U.S. market prices;
    - (2) To foods which have been manufactured or processed in the United States, its possessions, or Puerto Rico;
    - (3) To chemical warfare protective clothing produced in the countries listed in subsection 225.872-1 of the Defense FAR Supplement; or
    - (4) To fibers and yarns that are for use in synthetic fabric or coated synthetic fabric (but does apply to the synthetic or coated synthetic fabric itself), if--
      - (i) The fabric is to be used as a component of an end item that is not a textile product. Examples of textile products, made in whole or in part of fabric, include--
        - (a) Draperies, floor coverings, furnishings, and bedding (Federal Supply Group 72, Household and Commercial Furnishings and Appliances);
        - (B) Items made in whole or in part of fabric in Federal Supply Group 83, Textile/leather/furs/apparel/findings/tents/flags, or Federal Supply Group 84, Clothing, Individual Equipment and Insignia;
        - (C) Upholstered seats (whether for household, office, or other use); and
        - (D) Parachutes (Federal Supply Class 1670); or
        - (ii) The fibers and yarns are para-aramid fibers and yarns manufactured in the Netherlands.
- (End of clause)

**252.225-7031 SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)**

- (a) Definitions. As used in this clause--
  - (1) "Foreign person" means any person other than a United States person as defined in Section 16(2) of the Export Administration Act of 1979 (50 U.S.C. App. Sec 2415).
  - (2) "United States person" is defined in Section 16(2) of the Export Administration Act of 1979 and means any United States resident or national (other than an individual resident outside the United States and employed by other than a United States person), any domestic concern (including any permanent domestic establishment of any foreign

concern), and any foreign subsidiary or affiliate (including any permanent foreign establishment) of any domestic concern which is controlled in fact by such domestic concerns, as determined under regulations of the President.

(b) Certification. By submitting this offer, the Offeror, if a foreign person, company or entity, certifies that it--

(1) Does not comply with the Secondary Arab Boycott of Israel; and

(2) Is not taking or knowingly agreeing to take any action, with respect to the Secondary Boycott of Israel by Arab countries, which 50 U.S.C. App. Sec 2407(a) prohibits a United States person from taking.

(End of clause)

**252.227-7033 RIGHTS IN SHOP DRAWINGS (APR 1966)**

(a) Shop drawings for construction means drawings, submitted to the Government by the Construction Contractor, subcontractor or any lower-tier subcontractor pursuant to a construction contract, showing in detail (i) the proposed fabrication and assembly of structural elements and (ii) the installation (i.e., form, fit, and attachment details) of materials or equipment. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(b) This clause, including this paragraph (b), shall be included in all subcontracts hereunder at any tier.

**252.231-7000 SUPPLEMENTAL COST PRINCIPLES (DEC 1991)**

When the allowability of costs under this contract is determined in accordance with part 31 of the Federal Acquisition Regulation (FAR), allowability shall also be determined in accordance with part 231 of the Defense FAR Supplement, in effect on the date of this contract.

**252.236-7001 CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (AUG 2000)**

(a) The Government will provide to the Contractor, without charge, one set of contract drawings and specifications, except publications incorporated into the technical provisions by reference, in electronic or paper media as chosen by the Contracting Officer.

(b) The Contractor shall--

(1) Check all drawings furnished immediately upon receipt;

(2) Compare all drawings and verify the figures before laying out the work;

(3) Promptly notify the Contracting Officer of any discrepancies;

(4) Be responsible for any errors that might have been avoided by complying with this paragraph (b); and

(5) Reproduce and print contract drawings and specifications as needed.

(c) In general--

(1) Large-scale drawings shall govern small-scale drawings; and

(2) The Contractor shall follow figures marked on drawings in preference to scale measurements.

(d) Omissions from the drawings or specifications or the misdescription of details of work that are manifestly necessary to carry out the intent of the drawings and specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work. The Contractor shall perform such details as if fully and correctly set forth and described in the drawings and specifications.

(e) The work shall conform to the specifications and the contract drawings identified on the following index of drawings:

| Title           | File         | Drawing No.   |
|-----------------|--------------|---------------|
| Drawing Index   | DP000024.DGN | R-P-GF-00/024 |
| Drawing Index   | DP000025.DGN | R-P-GF-00/025 |
| (End of clause) |              |               |

**252.236-7008 CONTRACT PRICES - BIDDING SCHEDULES. (DEC 1991)**

(a) The Government's payment for the items listed in the Bidding Schedule shall constitute full compensation to the Contractor for --

(1) Furnishing all plant, labor, equipment, appliances, and materials; and

(2) Performing all operations required to complete the work in conformity with the drawings and specifications.

(b) The Contractor shall include in the prices for the items listed in the Bidding Schedule all costs for work in the specifications, whether or not specifically listed in the Bidding Schedule.

**252.242-7000 POSTAWARD CONFERENCE (DEC 1991)**

The Contractor agrees to attend any postaward conference convened by the contracting activity or contract administration office in accordance with Federal Acquisition Regulation subpart 42.5.

(End of clause)

**252.243-7001 PRICING OF CONTRACT MODIFICATIONS (DEC 1991)**

When costs are a factor in any price adjustment under this contract, the contract cost principles and procedures in FAR part 31 and DFARS part 231, in effect on the date of this contract, apply.

**252.243-7002 REQUESTS FOR EQUITABLE ADJUSTMENT (MAR 1998)**

(a) The amount of any request for equitable adjustment to contract terms shall accurately reflect the contract adjustment for which the Contractor believes the Government is liable. The request shall include only costs for performing the change, and shall not include any costs that already have been reimbursed or that have been separately claimed. All indirect costs included in the request shall be properly allocable to the change in accordance with applicable acquisition regulations.

(b) In accordance with 10 U.S.C. 2410(a), any request for equitable adjustment to contract terms that exceeds the simplified acquisition threshold shall bear, at the time of submission, the following certificate executed by an individual authorized to certify the request on behalf of the Contractor:

I certify that the request is made in good faith, and that the supporting data are accurate and complete to the best of my knowledge and belief.

-----  
(Official's Name)

-----  
(Title)

(c) The certification in paragraph (b) of this clause requires full disclosure of all relevant facts, including--

(1) Cost or pricing data if required in accordance with subsection 15.403-4 of the Federal Acquisition Regulation (FAR); and

(2) Information other than cost or pricing data, in accordance with subsection 15.403-3 of the FAR, including actual cost data and data to support any estimated costs, even if cost or pricing data are not required.

(d) The certification requirement in paragraph (b) of this clause does not apply to----

(1) Requests for routine contract payments; for example, requests for payment for accepted supplies and services, routine vouchers under a cost-reimbursement type contract, or progress payment invoices; or

(2) Final adjustment under an incentive provision of the contract.

**252.246-7000 MATERIAL INSPECTION AND RECEIVING REPORT (DEC 1991)**

At the time of each delivery of supplies or services under this contract, the Contractor shall prepare and furnish to the Government a Material Inspection and Receiving Report in the manner and to the extent required by Appendix F, Material Inspection and Receiving Report, of the Defense FAR Supplement.

(End of clause)

**252.247-7023 TRANSPORTATION OF SUPPLIES BY SEA (MAR 2000)**

(a) Definitions. As used in this clause --



- (1) "Components" means articles, materials, and supplies incorporated directly into end products at any level of manufacture, fabrication, or assembly by the Contractor or any subcontractor.
- (2) "Department of Defense" (DoD) means the Army, Navy, Air Force, Marine Corps, and defense agencies.
- (3) "Foreign flag vessel" means any vessel that is not a U.S.-flag vessel.
- (4) "Ocean transportation" means any transportation aboard a ship, vessel, boat, barge, or ferry through international waters.
- (5) "Subcontractor" means a supplier, materialman, distributor, or vendor at any level below the prime contractor whose contractual obligation to perform results from, or is conditioned upon, award of the prime contract and who is performing any part of the work or other requirement of the prime contract.
- (6) "Supplies" means all property, except land and interests in land, that is clearly identifiable for eventual use by or owned by the DoD at the time of transportation by sea.
  - (i) An item is clearly identifiable for eventual use by the DoD if, for example, the contract documentation contains a reference to a DoD contract number or a military destination.
  - (ii) "Supplies" includes (but is not limited to) public works; buildings and facilities; ships; floating equipment and vessels of every character, type, and description, with parts, subassemblies, accessories, and equipment; machine tools; material; equipment; stores of all kinds; end items; construction materials; and components of the foregoing.
- (7) "U.S.-flag vessel" means a vessel of the United States or belonging to the United States, including any vessel registered or having national status under the laws of the United States.
  - (b)(1) The Contractor shall use U.S.-flag vessels when transporting any supplies by sea under this contract.
  - (2) A subcontractor transporting supplies by sea under this contract shall use U.S.-flag vessels if--
    - (i) This contract is a construction contract; or
    - (ii) The supplies being transported are--
      - (A) Noncommercial items; or
      - (B) Commercial items that--
        - (1) The Contractor is reselling or distributing to the Government without adding value (generally, the Contractor does not add value to items that it contracts for f.o.b. destination shipment);
        - (2) Are shipped in direct support of U.S. military contingency operations, exercises, or forces deployed in humanitarian or peacekeeping operations; or
        - (3) Are commissary or exchange cargoes transported outside of the Defense Transportation System in accordance with 10 U.S.C. 2643.
  - (c) The Contractor and its subcontractors may request that the Contracting Officer authorize shipment in foreign-flag vessels, or designate available U.S.-flag vessels, if the Contractor or a subcontractor believes that --
    - (1) U.S.-flag vessels are not available for timely shipment;
    - (2) The freight charges are inordinately excessive or unreasonable; or

(3) Freight charges are higher than charges to private persons for transportation of like goods.

(d) The Contractor must submit any request for use of other than U.S.-flag vessels in writing to the Contracting Officer at least 45 days prior to the sailing date necessary to meet its delivery schedules. The Contracting Officer will process requests submitted after such date(s) as expeditiously as possible, but the Contracting Officer's failure to grant approvals to meet the shipper's sailing date will not of itself constitute a compensable delay under this or any other clause of this contract. Requests shall contain at a minimum --

(1) Type, weight, and cube of cargo;

(2) Required shipping date;

(3) Special handling and discharge requirements;

(4) Loading and discharge points;

(5) Name of shipper and consignee;

(6) Prime contract number; and

(7) A documented description of efforts made to secure U.S.-flag vessels, including points of contact (with names and telephone numbers) with at least two U.S.-flag carriers contacted. Copies of telephone notes, telegraphic and facsimile message or letters will be sufficient for this purpose.

(e) The Contractor shall, within 30 days after each shipment covered by this clause, provide the Contracting Officer and the Division of National Cargo, Office of Market Development, Maritime Administration, U.S. Department of Transportation, Washington, DC 20590, one copy of the rated on board vessel operating carrier's ocean bill of lading, which shall contain the following information --

(1) Prime contract number;

(2) Name of vessel;

(3) Vessel flag of registry;

(4) Date of loading;

(5) Port of loading;

(6) Port of final discharge;

(7) Description of commodity;

(8) Gross weight in pounds and cubic feet if available;

(9) Total ocean freight in U.S. dollars; and

(10) Name of the steamship company.

(f) The Contractor agrees to provide with its final invoice under this contract a representation that to the best of its knowledge and belief --

(1) No ocean transportation was used in the performance of this contract;

(2) Ocean transportation was used and only U.S.-flag vessels were used for all ocean shipments under the contract;

(3) Ocean transportation was used, and the Contractor had the written consent of the Contracting Officer for all non-U.S.-flag ocean transportation; or

(4) Ocean transportation was used and some or all of the shipments were made on non-U.S.-flag vessels without the written consent of the Contracting Officer. The Contractor shall describe these shipments in the following format:

| ITEM<br>DESCRIPTION | CONTRACT<br>LINE ITEMS | QUANTITY |
|---------------------|------------------------|----------|
|                     |                        |          |
|                     |                        |          |
|                     |                        |          |
|                     |                        |          |
| TOTAL               |                        |          |

(g) If the final invoice does not include the required representation, the Government will reject and return it to the Contractor as an improper invoice for the purposes of the Prompt Payment clause of this contract. In the event there has been unauthorized use of non-U.S.-flag vessels in the performance of this contract, the Contracting Officer is entitled to equitably adjust the contract, based on the unauthorized use.

(h) The Contractor shall include this clause, including this paragraph (h), in all subcontractors under this contract that--

(1) Exceed the simplified acquisition threshold in Part 2 of the Federal Acquisition Regulation; and

(2) Are for a type of supplies described in paragraph (b)(3) of this clause.

(End of clause)

***252.247-7024 NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY SEA (MAR 2000)***

(a) The Contractor has indicated by the response to the solicitation provision, Representation of Extent of Transportation by Sea, that it did not anticipate transporting by sea any supplies. If, however, after the award of this contract, the Contractor learns that supplies, as defined in the Transportation of Supplies by Sea clause of this contract, will be transported by sea, the Contractor --

(1) Shall notify the Contracting Officer of that fact; and

(2) Hereby agrees to comply with all the terms and conditions of the Transportation of Supplies by Sea clause of this contract.

(b) The Contractor shall include this clause; including this paragraph (b), revised as necessary to reflect the relationship of the contracting parties--

(1) In all subcontracts under this contract, if this contract is a construction contract; or

(2) If this contract is not a construction contract, in all subcontracts under this contract that are for--

(i) Noncommercial items; or

(ii) Commercial items that--

(A) The Contractor is reselling or distributing to the Government without adding value (generally, the Contractor does not add value to items that it subcontracts for f.o.b. destination shipment);

(B) Are shipped in direct support of U.S. military contingency operations, exercises, or forces deployed in humanitarian or peacekeeping operations; or

(C) Are commissary or exchange cargoes transported outside of the Defense Transportation System in accordance with 10 U.S.C. 2643.

(End of clause)

**252.248-7000 PREPARATION OF VALUE ENGINEERING CHANGE PROPOSALS (MAY 1994)**

Prepare value engineering change proposals, for submission pursuant to the value engineering clause of this contract, in the format prescribed by the version of MIL-STD-973 in effect on the date of contract award.

(End of clause)

**SECTION 00800 Special Contract Requirements****CLAUSES INCORPORATED BY FULL TEXT****52.000-4004 PARTNERING**

The Government proposes to form a partnering relationship with the contractor. This partnering relationship will strive to facilitate communication and draw on the strengths of each organization in an effort to achieve a quality project, within budget, and on schedule. Participation will be totally voluntary. Partnering will not alter or supersede any provision of this contract nor will it provide either party with any additional contractual rights or obligations. Participation in partnering will not affect award of this contract. Any cost associated with this partnering will be agreed to by both parties and will be shared equally, with no change in contract price.

**52.212-4003 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (OCT 1989) ER 415-1-15**

a. This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the CONTRACT CLAUSES: DEFAULT (FIXED-PRICE CONSTRUCTION). In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

- 1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.
- 2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

b. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

**MONTHLY ANTICIPATED ADVERSE WEATHER DELAY  
WORKDAYS BASED ON (5) DAY WORKWEEK.**

GEOGRAPHIC LOCATION -- Grand Forks, North Dakota

| Month | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Days  | 20  | 14  | 9   | 3   | 3   | 4   | 4   | 4   | 3   | 2   | 7   | 17  |

c. Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the Contractor's scheduled workday. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph b, above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the CONTRACT CLAUSES: DEFAULT (FIXED-PRICE CONSTRUCTION).

**52.212-5000 EVALUATION OF SUBDIVIDED ITEMS (MAR 1995)--EFARS**

Item Nos. 0044, 0048, 0049, 0076, 0079, 0081, 0082, 0094, 0098, 0099, 0100, 0121, 0124, 0126, 0127, 0128, and 0130 are subdivided into two or more estimated quantities and are to be separately priced. The Government will evaluate each of these items on the basis of total price of its sub-items.

(End of provision)

**52.212-5001 VARIATIONS IN ESTIMATED QUANTITIES, SUBDIVIDED ITEMS (MAR 1995)--EFARS**

This variation in estimated quantities clause is applicable only to Items Nos. 0044, 0048, 0049, 0076, 0079, 0081, 0082, 0094, 0098, 0099, 0100, 0121, 0124, 0126, 0127, 0128, and 0130

(a) Variation from the estimated quantity in the actual work performed under any second or subsequent sub-item or elimination of all work under such a second or subsequent sub-item will not be the basis for an adjustment in contract unit price.

(b) Where the actual quantity of work performed for Items Nos., is less 0044, 0048, 0049, 0076, 0079, 0081, 0082, 0094, 0098, 0099, 0100, 0121, 0124, 0126, 0127, 0128, and 0130 than 85% of the quantity of the first sub-item listed under such item, the contractor will be paid at the contract unit price for that sub-item for the actual quantity of work performed and, in addition, an equitable adjustment shall be made in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

(c) If the actual quantity of work performed under Items Nos. 0044, 0048, 0049, 0076, 0079, 0081, 0082, 0094, 0098, 0099, 0100, 0121, 0124, 0126, 0127, 0128, and 0130 exceeds 115% or is less than 85% of the total estimated quantity of the sub-item under that item and/or if the quantity of the work performed under the second sub-item or any subsequent sub-item under Items Nos. 0044, 0048, 0049, 0076, 0079, 0081, 0082, 0094, 0098, 0099, 0100, 0121, 0124, 0126, 0127, 0128, and 0130 exceeds 115% or is less than 85% of the estimated quantity of any such sub-item, and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

(End of clause)

**52.214-5000 ARITHMETIC DISCREPANCIES – EFARS**

(a) For the purpose of initial evaluation of bids, the following will be utilized in resolving arithmetic discrepancies found on the face of bidding schedule as submitted by the bidder:

- (1) Obviously misplaced decimal points will be corrected;
- (2) Discrepancy between unit price and extended price, the unit price will govern;
- (3) Apparent errors in extension of unit prices will be corrected;
- (4) Apparent errors in addition of lump sum and extended prices will be corrected.

(b) For the purpose of bid evaluation, the government will proceed on the assumption that the bidder intends his bid to be evaluated on basis of the unit prices, the totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.

(c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

(End of statement)

**52.228-4002      *INSURANCE***

As referenced in Contract Clause: INSURANCE--WORK ON A GOVERNMENT INSTALLATION, the following types and amounts of insurance are required under this contract.

| Type  | Amount   |
|---|--|
| Worker's Compensation and Employer's Liability Insurance:   |  |
| Coverage A<br>Worker's Compensation                         | Compliance with State of North Dakota<br>Worker's Compensation Law |
| Coverage B<br>Employer's Liability                          | \$ 100,000   |
| General Liability Insurance:                                |  |
| Bodily Injury   | \$1,000,000 per occurrence   |
| Property Damage   | Not Required   |
| Automobile Liability Insurance (Comprehensive Policy Form): |  |
| Bodily Injury   | \$ 500,000 per person and<br>\$1,000,000 per occurrence            |
| Property Damage   | \$ 100,000 per occurrence  |

**52.228-4022      *REQUIREMENT FOR BID GUARANTEE (FAR 28.101-2)***

Each bidder shall submit with its bid a Bid Bond (Standard Form 24) with good and sufficient surety or sureties acceptable to the Government or other security as provided in the clause BID GUARANTEE in the form of twenty percent (20%) of the bid price or \$3,000,000 whichever is lesser. The bid bond penalty may be expressed in terms of a percentage of the bid price or may be expressed in dollars and cents.

**52.231-5000      *EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE*  
MAR 1995)—EFARS**

(a) This clause does not apply to terminations. See 52.249-5000, Basis for Settlement of Proposals and FAR Part 49.

(b) Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the contractor's

accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, Region [insert Roman numeral for the appropriate region of the schedule]. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the contracting officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

(c) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

(d) When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the contracting officer shall request the contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet.

(End of clause)

#### **52.232-4004 INVOICE PROCEDURES**

In accordance with CONTRACT CLAUSE titled "PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS", the contractor shall submit invoices as follows:

a. In order to qualify for a periodic payment, the Contractor must submit a proper invoice (request for payment) to the Contracting Officer's Representative (COR) and a determination must be made that supplies or services conform to the contract requirements. This determination will be made for the sole purpose of processing progress payments and will not constitute formal acceptance. The due date for making progress payments shall be as stated in the contract clause: PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS.

b. The submitted request for payment must be accompanied with documentation adequate to substantiate the amount requested. Substantiation shall be consistent with the clauses in the solicitation titled Quantity Surveys, Purchase Orders, Invoices, etc. satisfactory to the COR.

c. The Contractor must also include with the payment request a certification as described in the Clause "PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS".

d. Payment requests will be reviewed for propriety by the COR. Defective invoices will be returned to the Contractor for resolution with defects identified. Along with the returned invoice, the COR may include, at its option, an ENG FORM 93-PAYMENT ESTIMATE reflecting the substantiated and uncontested payment amount. The Contractor will then be given the option of signing and returning the FORM 93 for payment along with the original invoice and certification or resubmitting a revised invoice and certification. To expedite payment, the Contractor may request in writing that the COR retain the defective invoice and immediately process the payment request at the amount determined to be acceptable to the Government.

#### **52.232-5001 CONTINUING CONTRACTS (MAR 1995)—EFARS**

(a) This is a continuing contract, as authorized by Section 10 of the River and Harbor Act of September 22, 1922 (33 U.S. Code 621). The payment of some portion of the contract price is dependent upon reservations of funds from future appropriations, and from future contribution to the project having one or more non-federal project



sponsors. The responsibilities of the Government are limited by this clause notwithstanding any contrary provision of the "Payments to Contractor" clause or any other clause of this contract.

(b) The sum of \$1,000,000 has been reserved for this contract and is available for payments to the contractor during the current fiscal year. It is expected that Congress will make appropriations for future fiscal years from which additional funds together with funds provided by one or more non-federal project sponsors will be reserved for this contract.

(c) Failure to make payments in excess of the amount currently reserved, or that may be reserved from time to time, shall not entitle the contractor to a price adjustment under the terms of this contract except as specifically provided in paragraphs (f) and (i) below. No such failure shall constitute a breach of this contract, except that this provision shall not bar a breach-of-contract action if an amount finally determined to be due as a termination allowance remains unpaid for one year due solely to a failure to reserve sufficient additional funds therefore.

(d) The Government may at any time reserve additional funds for payments under the contract if there are funds available for such purpose. The contracting officer will promptly notify the contractor of any additional funds reserved for the contract by issuing an administrative modification to the contract.

(e) If earnings will be such that funds reserved for the contract will be exhausted before the end of any fiscal year, the contractor shall give written notice to the contracting officer of the estimated date of exhaustion and the amount of additional funds which will be needed to meet payments due or to become due under the contract during that fiscal year. This notice shall be given not less than 45 nor more than 60 days prior to the estimated date of exhaustion.

(f) No payments will be made after exhaustion of funds except to the extent that additional funds are reserved for the contract. The contractor shall be entitled to simple interest on any payment that the contracting officer determines was actually earned under the terms of the contract and would have been made except for exhaustion of funds. Interest shall be computed from the time such payment would otherwise have been made until actually or constructively made, and shall be at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97, as in effect on the first day of the delay in such payment.

(g) Any suspension, delay, or interruption of work arising from exhaustion or anticipated exhaustion of funds shall not constitute a breach of this contract and shall not entitle the contractor to any price adjustment under the "Suspension of Work" clause or in any other manner under this contract.

(h) An equitable adjustment in performance time shall be made for any increase in the time required for performance of any part of the work arising from exhaustion of funds or the reasonable anticipation of exhaustion of funds.

(i) If, upon the expiration of sixty (60) days after the beginning of the fiscal year following an exhaustion of funds, the Government has failed to reserve sufficient additional funds to cover payments otherwise due, the contractor, by written notice delivered to the contracting officer at any time before such additional funds are reserved, may elect to treat his right to proceed with the work as having been terminated. Such a termination shall be considered a termination for the convenience of the Government.

(j) If at any time it becomes apparent that the funds reserved for any fiscal year are in excess of the funds required to meet all payments due or to become due the contractor because of work performed and to be performed under the contract during the fiscal year, the Government reserves the right, after notice to the contractor, to reduce said reservation by the amount of such excess.

(End of clause)

**52.236-15 SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984)**

- (a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule.
- (b) The Contractor shall enter the actual progress on the chart as directed by the Contracting Officer, and upon doing so shall immediately deliver three copies of the annotated schedule to the Contracting Officer. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.
- (c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of this contract.

**52.236-16 QUANTITY SURVEYS (APR 1984) - ALTERNATE I (APR 1984)**

- (a) Quantity surveys shall be conducted, and the data derived from these surveys shall be used in computing the quantities of work performed and the actual construction completed and in place.
- (b) The Contractor shall conduct the original and final surveys and surveys for any periods for which progress payments are requested. All these surveys shall be conducted under the direction of a representative of the Contracting Officer, unless the Contracting Officer waives this requirement in a specific instance. The Government shall make such computations as are necessary to determine the quantities of work performed or finally in place. The Contractor shall make the computations based on the surveys for any periods for which progress payments are requested.
- (c) Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes and all other records relating to the survey or to the layout of the work to the Contracting Officer, who shall use them as necessary to determine the amount of progress payments. The

Contractor shall retain copies of all such material furnished to the Contracting Officer.

(End of clause)

**52.236-4006      SAFETY AND HEALTH REQUIREMENTS MANUAL INTERIM CHANGES, EM 385-1-1 (APR 2001)**

This paragraph applies to contracts and purchase orders that require the contractor to comply with EM 385-1-1 (e.g., contracts that include the Accident Prevention clause at FAR 52.236-13 and/or other safety provisions). EM 385-1-1 and its changes are available at <http://www.hq.usace.army.mil> (at the HQ homepage, select Safety and Occupational Health). The Contractor shall be responsible for complying with the current edition and all changes posted on the web as of the effective date of this solicitation.

**52.236-4012      MATERIAL SOURCES**

- a. Concrete aggregate and stone protection materials meeting the requirements of these specifications can be produced from the sources listed in Section 00830 "Attachments":
- b. Materials may be furnished from any of the listed sources or at the option of the Contractor may be furnished from any other sources designated by the Contractor and approved by the Contracting Officer, subject to the conditions hereinafter stated.
- c. After the award of the contract, the Contractor shall designate in writing only one source for each type of material or one combination of sources from which he proposes to furnish the materials. If the Contractor proposes to furnish materials from a source or from sources not listed, he may designate only a single source for each type of material or single combination of sources for materials. Samples for acceptance testing shall be provided as required by the TECHNICAL PROVISIONS. If a source for materials so designated by the Contractor is not approved for use by the Contracting Officer, the Contractor may not submit for approval other sources but shall furnish the materials from approved sources selected from the list at no additional cost to the Government.
- d. Approval of a source of materials is not to be construed as approval of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels, when such materials are unsuitable as determined by the Contracting Officer. Materials produced from an approved source shall meet all the requirements of the TECHNICAL PROVISIONS of these specifications.

**52.236-4014      PURCHASE ORDERS**

Two legible copies of each purchase order issued by the Contractor or the Contractor's subcontractors for materials and equipment to be incorporated into the project, shall be furnished the Contracting Officer as soon as issued. Each purchase order shall (1) be clearly identified with applicable Department of Army contract number, (2) carry and identifying number, (3) be in sufficient detail to identify the material being purchased, and (4) indicate a definite delivery date. At the option of the Contractor, the copies of the purchase orders may or may not indicate the price of the articles purchased.

**52.236-4061      OBSTRUCTION OF CHANNEL**

The Government will not undertake to keep the channel free from vessels or other obstructions, except to the extent of such regulations, if any, as may be prescribed by the Secretary of the Army, in accordance with the Provisions of Section 7 of the River and Harbor Act approved August 8, 1917. The Contractor will be required to conduct the work in such manner as to obstruct navigation as little as possible. The Contractor shall consult with the

appropriate Coast Guard office to determine whether a Notice to Mariners will need to be issued for construction-related activities that might interfere with navigation or be interfered with by such navigation. (Point of Contact: Marine Safety Detachment, St. Paul, Minnesota, 651-290-3991) If the Contractor's plant so obstructs the channel as to make difficult or endanger the passage of vessels, said plant shall be promptly moved on the approach of any vessel to such an extent as may be necessary to afford a practicable passage. Upon the completion of the work the Contractor shall promptly remove his plant, including ranges, buoys, piles, and other marks placed by him under the contract whether in navigable waters or on shore.

**52.239-4001      *YEAR 2000 COMPLIANCE (FAR 39.106) (JUL 1998)***

The contractor shall ensure that, with respect to any design, construction, goods, or services under this contract as well as any subsequent task/delivery orders issued under this contract (if applicable), all information technology contained therein shall be Year 2000 compliant. Specifically, the contractor shall perform, maintain, and provide an inventory of all major components to include structures, equipment, items, parts, and furnishings under this contract and each task/delivery order which may be affected by the Year 2000 compliance requirement.

**52.242-14      *SUSPENSION OF WORK (APR 1984)***

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract. (c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

**52.245-2      *GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS) (DEC 1989)***

(a) Government-furnished property. (1) The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the Government-furnished property described in the Schedule or specifications together with any related data and information that the Contractor may request and is reasonably required for the intended use of the property (hereinafter referred to as "Government-furnished property").

(2) The delivery or performance dates for this contract are based upon the expectation that Government-furnished property suitable for use (except for property furnished "as is") will be delivered to the Contractor at the times stated

in the Schedule or, if not so stated, in sufficient time to enable the Contractor to meet the contract's delivery or performance dates.

(3) If Government-furnished property is received by the Contractor in a condition not suitable for the intended use, the Contractor shall, upon receipt of it, notify the Contracting Officer, detailing the facts, and, as directed by the Contracting Officer and at Government expense, either repair, modify, return, or otherwise dispose of the property. After completing the directed action and upon written request of the Contractor, the Contracting Officer shall make an equitable adjustment as provided in paragraph (h) of this clause.

(4) If Government-furnished property is not delivered to the Contractor by the required time, the Contracting Officer shall, upon the Contractor's timely written request, make a determination of the delay, if any, caused the Contractor and shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(b) Changes in Government-furnished property. (1) The Contracting Officer may, by written notice, (i) decrease the Government-furnished property provided or to be provided under this contract, or (ii) substitute other Government-furnished property for the property to be provided by the Government, or to be acquired by the Contractor for the Government, under this contract. The Contractor shall promptly take such action as the Contracting Officer may direct regarding the removal, shipment, or disposal of the property covered by such notice.

(2) Upon the Contractor's written request, the Contracting Officer shall make an equitable adjustment to the contract in accordance with paragraph (h) of this clause, if the Government has agreed in the Schedule to make the property available for performing this contract and there is any--

(i) Decrease or substitution in this property pursuant to subparagraph (b)(1) of this clause; or

(ii) Withdrawal of authority to use this property, if provided under any other contract or lease.

(c) Title in Government property. (1) The Government shall retain title to all Government-furnished property.

(2) All Government-furnished property and all property acquired by the Contractor, title to which vests in the Government under this paragraph (collectively referred to as "Government property"), are subject to the provisions of this clause. However, special tooling accountable to this contract is subject to the provisions of the Special Tooling clause and is not subject to the provisions of this clause. Title to Government property shall not be affected by its incorporation into or attachment to any property not owned by the Government, nor shall Government property become a fixture or lose its identity as personal property by being attached to any real property.

(3) Title to each item of facilities and special test equipment acquired by the Contractor for the Government under this contract shall pass to and vest in the Government when its use in performing this contract commences or when the Government has paid for it, whichever is earlier, whether or not title previously vested in the Government.

(4) If this contract contains a provision directing the Contractor to purchase material for which the Government will reimburse the Contractor as a direct item of cost under this contract--

(i) Title to material purchased from a vendor shall pass to and vest in the Government upon the vendor's delivery of such material; and

(ii) Title to all other material shall pass to and vest in the Government upon--

(A) Issuance of the material for use in contract performance;

(B) Commencement of processing of the material or its use in contract performance; or

(C) Reimbursement of the cost of the material by the Government, whichever occurs first.

(d) Use of Government property. The Government property shall be used only for performing this contract, unless otherwise provided in this contract or approved by the Contracting Officer.

(e) Property administration. (1) The Contractor shall be responsible and accountable for all Government property provided under this contract and shall comply with Federal Acquisition Regulation (FAR) Subpart 45.5, as in effect on the date of this contract.

(2) The Contractor shall establish and maintain a program for the use, maintenance, repair, protection, and preservation of Government property in accordance with sound industrial practice and the applicable provisions of Subpart 45.5 of the FAR.

(3) If damage occurs to Government property, the risk of which has been assumed by the Government under this contract, the Government shall replace the items or the Contractor shall make such repairs as the Government directs. However, if the Contractor cannot effect such repairs within the time required, the Contractor shall dispose of the property as directed by the Contracting Officer. When any property for which the Government is responsible is replaced or repaired, the Contracting Officer shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(4) The Contractor represents that the contract price does not include any amount for repairs or replacement for which the Government is responsible. Repair or replacement of property for which the Contractor is responsible shall be accomplished by the Contractor at its own expense.

(f) Access. The Government and all its designees shall have access at all reasonable times to the premises in which any Government property is located for the purpose of inspecting the Government property.

(g) Risk of loss. Unless otherwise provided in this contract, the Contractor assumes the risk of, and shall be responsible for, any loss or destruction of, or damage to, Government property upon its delivery to the Contractor or upon passage of title to the Government under paragraph (c) of this clause. However, the Contractor is not responsible for reasonable wear and tear to Government property or for Government property properly consumed in performing this contract.

(h) Equitable adjustment. When this clause specifies an equitable adjustment, it shall be made to any affected contract provision in accordance with the procedures of the Changes clause. When appropriate, the Contracting Officer may initiate an equitable adjustment in favor of the Government. The right to an equitable adjustment shall be the Contractor's exclusive remedy. The Government shall not be liable to suit for breach of contract for--

(1) Any delay in delivery of Government-furnished property;

(2) Delivery of Government-furnished property in a condition not suitable for its intended use;

(3) A decrease in or substitution of Government-furnished property; or

(4) Failure to repair or replace Government property for which the Government is responsible.

(i) Final accounting and disposition of Government property. Upon completing this contract, or at such earlier dates as may be fixed by the Contracting Officer, the Contractor shall submit, in a form acceptable to the Contracting Officer, inventory schedules covering all items of Government property (including any resulting scrap) not consumed in performing this contract or delivered to the Government. The Contractor shall prepare for shipment, deliver f.o.b. origin, or dispose of the Government property as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid to the Government as the Contracting Officer directs.

(j) Abandonment and restoration of Contractor's premises. Unless otherwise provided herein, the Government--

(1) May abandon any Government property in place, at which time all obligations of the Government regarding such abandoned property shall cease; and

(2) Has no obligation to restore or rehabilitate the Contractor's premises under any circumstances (e.g., abandonment, disposition upon completion of need, or upon contract completion). However, if the Government-furnished property (listed in the Schedule or specifications) is withdrawn or is unsuitable for the intended use, or if other Government property is substituted, then the equitable adjustment under paragraph (h) of this clause may properly include restoration or rehabilitation costs.

(k) Communications. All communications under this clause shall be in writing.

(l) Overseas contracts. If this contract is to be performed outside of the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished," respectively.

(End of clause)

#### **52.245-3 IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY (APR 1984)**

(a) The Government will furnish to the Contractor the property identified in the Schedule to be incorporated or installed into the work or used in performing the contract. The listed property will be furnished f.o.b. railroad cars at the place specified in the contract Schedule or f.o.b. truck at the project site. The Contractor is required to accept delivery, pay any demurrage or detention charges, and unload and transport the property to the job site at its own expense. When the property is delivered, the Contractor shall verify its quantity and condition and acknowledge receipt in writing to the Contracting Officer. The Contractor shall also report in writing to the Contracting Officer within 24 hours of delivery any damage to or shortage of the property as received. All such property shall be installed or incorporated into the work at the expense of the Contractor, unless otherwise indicated in this contract.

(b) Each item of property to be furnished under this clause shall be identified in the Schedule by quantity, item, and description.

(End of clause)

#### **52.245-19 GOVERNMENT PROPERTY FURNISHED "AS IS" (APR 1984)**

(a) The Government makes no warranty whatsoever with respect to Government property furnished "as is," except that the property is in the same condition when placed at the f.o.b. point specified in the solicitation as when inspected by the Contractor pursuant to the solicitation or, if not inspected by the Contractor, as when last available for inspection under the solicitation.

(b) The Contractor may repair any property made available on an "as is" basis. Such repair will be at the Contractor's expense except as otherwise provided in this clause. Such property may be modified at the Contractor's expense, but only with the written permission of the Contracting Officer. Any repair or modification of property furnished "as is" shall not affect the title of the Government.

(c) If there is any change in the condition of Government property furnished "as is" from the time inspected or last available for inspection under the solicitation to the time placed on board at the location specified in the solicitation, and such change will adversely affect the Contractor, the Contractor shall, upon receipt of the property, notify the Contracting Officer detailing the facts and, as directed by the Contracting Officer, either (1) return such property at the Government's expense or otherwise dispose of the property or (2) effect repairs to return the property to its condition when inspected under the solicitation or, if not inspected, last available for inspection under the

solicitation. After completing the directed action and upon written request of the Contractor, the Contracting Officer shall equitably adjust any contractual provisions affected by the return, disposition, or repair in accordance with the procedures provided for in the Changes clause of this contract. The foregoing provisions for adjustment are the exclusive remedy available to the Contractor, and the Government shall not be otherwise liable for any delivery of Government property furnished "as is" in a condition other than that in which it was originally offered.

(d) Except as otherwise provided in this clause, Government property furnished "as is" shall be governed by the Government Property clause of this contract.

#### **52.245-4002      *GOVERNMENT-FURNISHED PROPERTY IDENTIFICATION AND LOCATION***

a) The Government will furnish to the Contractor the property listed below to be incorporated or installed into the work or used in performing the contract. The Contractor shall arrange for pickup of the Government furnished property, which is located within the city of Grand Forks, North Dakota. The Contractor shall arrange pickup of the property by contacting Craig Johnson at Telephone No. 701-722-8292. When the property is picked up, the Contractor shall verify its quantity and condition and acknowledge receipt in writing to the Contracting Officer. The Contractor shall also report in writing to the Contracting Officer within 24 hours of pickup any damage to or shortage of the property as received. All such property shall be installed or incorporated into the work at the expense of the Contractor, unless otherwise indicated in this contract.

b) The following is a list of Government-Furnished Property:

SEE TECHNICAL SECTION 01000-GENERAL

(1) Quantities indicated for the above-listed items which are marked with an asterisk are estimated. It is the intention of the Government to furnish all of these items required to complete the work as specified and the various quantities will be adjusted when necessary.

(2) Quantities stated for the above items which are not marked with an asterisk are all that will be furnished by the Government. These quantities are not to be considered as indications or warranties that the amounts stated will either be sufficient or insufficient. The Contractor will be required to furnish any additional quantities required.

#### **52.246-12      *INSPECTION OF CONSTRUCTION (AUG 1996)***

(a) Definition. "Work" includes, but is not limited to, materials, workmanship, and manufacture and fabrication of components.

(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the Government. All work shall be conducted under the general direction of the Contracting Officer and is subject to Government inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) Government inspections and tests are for the sole benefit of the Government and do not--

(1) Relieve the Contractor of responsibility for providing adequate quality control measures;



- (2) Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;
  - (3) Constitute or imply acceptance; or
  - (4) Affect the continuing rights of the Government after acceptance of the completed work under paragraph (i) of this section.
- (d) The presence or absence of a Government inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Contracting Officer's written authorization.
- (e) The Contractor shall promptly furnish, at no increase in contract price, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The Government may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The Government shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.
- (f) The Contractor shall, without charge, replace or correct work found by the Government not to conform to contract requirements, unless in the public interest the Government consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.
- (g) If the Contractor does not promptly replace or correct rejected work, the Government may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the Contractor's right to proceed.
- (h) If, before acceptance of the entire work, the Government decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satisfactory reconstruction. However, if the work is found to meet contract requirements, the Contracting Officer shall make an equitable adjustment for the additional services involved in the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.
- (i) Unless otherwise specified in the contract, the Government shall accept, as promptly as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the Government's rights under any warranty or guarantee.

#### **52.249-5000      *BASIS FOR SETTLEMENT OF PROPOSALS***

“Actual costs will be used to determine equipment costs for a settlement proposal submitted on the total cost basis under FAR 49.206-2(b). In evaluating a terminations settlement proposal using the total cost basis, the following principles will be applied to determine allowable equipment costs:

- (1) Actual costs for each piece of equipment, or groups of similar serial or series equipment, need not be available in the contractor's accounting records to determine total actual equipment costs.
- (2) If equipment costs have been allocated to a contract using predetermined rates, those charges will be adjusted to actual costs.

- (3) Recorded job costs adjusted for unallowable expenses will be used to determine equipment operating expenses.
- (4) Ownership costs (depreciation) will be determined using the contractor's depreciation schedule (subject to the provisions of FAR 31.205-11).
- (5) License, taxes, storage and insurance costs are normally recovered as an indirect expense and unless the contractor charges these costs directly to contracts, they will be recovered through the indirect expense rate.”

(End of Clause)

**252.236-7000 MODIFICATION PROPOSALS - PRICE BREAKDOWN. (DEC 1991)**

- (a) The Contractor shall furnish a price breakdown, itemized as required and within the time specified by the Contracting Officer, with any proposal for a contract modification.
- (b) The price breakdown --
  - (1) Must include sufficient detail to permit an analysis of profit, and of all costs for --
    - (i) Material;
    - (ii) Labor;
    - (iii) Equipment;
    - (iv) Subcontracts; and
    - (v) Overhead; and
  - (2) Must cover all work involved in the modification, whether the work was deleted, added, or changed.
- (c) The Contractor shall provide similar price breakdowns to support any amounts claimed for subcontracts.
- (d) The Contractor's proposal shall include a justification for any time extension proposed.

SECTION 00830

ATTACHMENTS

INDEX

| ATTACHMENT | TITLE               |
|------------|---------------------|
| 1          | SECTION 401 PERMIT  |
| 2          | WAGE RATES          |
| 3          | MATERIAL SOURCES    |
| 4          | LOCAL PRECIPITATION |

SECTION 00830

ATTACHMENT 1

SECTION 401 PERMIT

SECTION 00830

ATTACHMENT 2

WAGE RATES

| <u>GENERAL<br/>DECISION NUMBER</u> | <u>CONSTRUCTION TYPE</u> | <u>PAGE</u> |
|------------------------------------|--------------------------|-------------|
| ND020014                           | Heavy                    | 1 through 2 |

## General Decision Number ND020014

General Decision Number ND020014

Superseded General Decision No. ND010014

State: **North Dakota**

Construction Type:

HEAVY

County(ies):

BURLEIGH

**GRAND FORKS**

CASS

MORTON

HEAVY CONSTRUCTION PROJECTS (Excluding Sewer & Water Line

Construction & Drainage Projects)

Modification Number Publication Date

0

03/01/2002

1

04/19/2002

COUNTY(ies):

BURLEIGH

**GRAND FORKS** CASS

MORTON

ELEC0714I 01/01/2001

Rates

Fringes

BURLEIGH AND MORTON COUNTIES:

ELECTRICIANS:

ELECTRICIAN

23.45

10.5%+a

CABLE SPLICER

23.85

10.5%+a

FOOTNOTE;

a. \$5.20 per hour.

\* ELEC14260 06/01/2001

Rates

Fringes

CASS AND **GRAND FORKS** COUNTIES:

WIREMAN

20.30

5.20+12%

CABLE SPLICER

21.32

5.20+12%

SUND2006A 05/04/2000

Rates

Fringes

LABORERS:

Common

9.92

Pipelayers

12.00

PAINTER:

Brush,Roller,& Spray

17.00

POWER EQUIPMENT OPERATORS:

Backhoe

15.74

4.84

Bobcat

12.60

4.50

Bulldozer

14.41

4.50

Crane

13.29

3.42

Front End Loader

14.93

Motor Grader

18.10

Scraper

16.13

Tractor

12.13

TRUCK DRIVER:

Dump

8.50

Tandem/Semi

15.77

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(v)).

-----  
In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U. S. Department of Labor  
200 Constitution Avenue, N. W.  
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N. W.  
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U. S. Department of Labor  
200 Constitution Avenue, N. W.  
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

---

SECTION 00830

ATTACHMENT 3

MATERIAL SOURCES



ATTACHMENT 3 MATERIAL SOURCES

CONCRETE AGGREGATE SOURCES

SOURCE OR OPERATOR

LOCATION

Fine Concrete Aggregate:

Forester Pit  
Bradshaw Gravel Supply  
(Strata Corp.)  
(701) 746-7491

Trail Pit  
Bradshaw Gravel Supply  
(Strata Corp.)  
(701) 746-7491

Anderson Pit  
Bradshaw Gravel Supply  
(Strata Corp.)  
(701) 746-7491

Loeffler Pit  
Loeffler Concrete & Gravel  
(218) 265-2676

NW ¼, Sec. 32  
T 160 N, R 46 W  
Kittson County, MN

Sec. 25  
T 150 N, R 40 W  
Polk County, MN

Sec. 6  
T 138 N, R 41 W  
Becker County, MN

E ¼, Sec. 17  
T 160 N, R 46 W  
Kittson County, MN

Coarse Concrete Aggregate:

J & S Gravel Pit  
Northern Paving Co.  
(218) 281-5101

Forester Pit  
Bradshaw Gravel Supply  
(Strata Corp.)  
(701) 746-7491

Trail Pit  
Bradshaw Gravel Supply  
(Strata Corp.)  
(701) 746-7491

Anderson Pit  
Bradshaw Gravel Supply  
(Strata Corp.)  
(701) 746-7491

Loeffler Pit  
Loeffler Concrete & Gravel  
(218) 265-2676

SE ¼, Sec. 30  
T 150 N, R 44 W  
Red Lake County, MN

NW ¼, Sec. 32  
T 160 N, R 46 W  
Kittson County, MN

Sec. 25  
T 150 N, R 40 W  
Polk County, MN

Sec. 6  
T 138 N, R 41 W  
Becker County, MN

E ¼, Sec. 17  
T 160 N, R 46 W  
Kittson County, MN

ATTACHMENT 3 MATERIAL SOURCES

RIPRAP STONE SOURCES

SOURCE OR OPERATOR

LOCATION

Trail Pit  
Bradshaw Gravel Supply  
Box 13500  
Grand Forks, ND 58208  
(701) 746-7491

T 150 N, R 40 W  
Section 25  
Polk County, MN

Dave Dunham Pit  
Felton, MN  
(218) 494-3360

T 142 N, R 45 W  
Sections 28 and 29  
Clay County, MN

CAMAS Kost Division  
Box 1036  
Moorhead, MN  
(218) 236-9640

T 142 N, R 45 W  
W 1/2, Section 32  
Clay County, MN

Southerland Quarry  
Bradshaw Gravel Supply  
Box 13500  
Grand Forks, ND 58208  
(701) 746-7491

T 162 N, R 34 W  
NW 1/4, SW 1/4, Section 6  
Lake of the Woods County, MN

Meridian Aggregate Co.  
Box 69  
St. Cloud, MN  
(320) 251-7141

T 124 N, R 28 W  
SE 1/4, Section 18  
Stearns County, MN

Meridian Aggregate Co.  
200 14th Street  
Granite Falls, MN  
(320) 564-2125

T 116 N, R 39 W  
Sections 28, 29, 32, 33  
Yellow Medicine County, MN

Ortonville Stone Co.  
Box 67  
Ortonville, MN  
(320) 839-6131

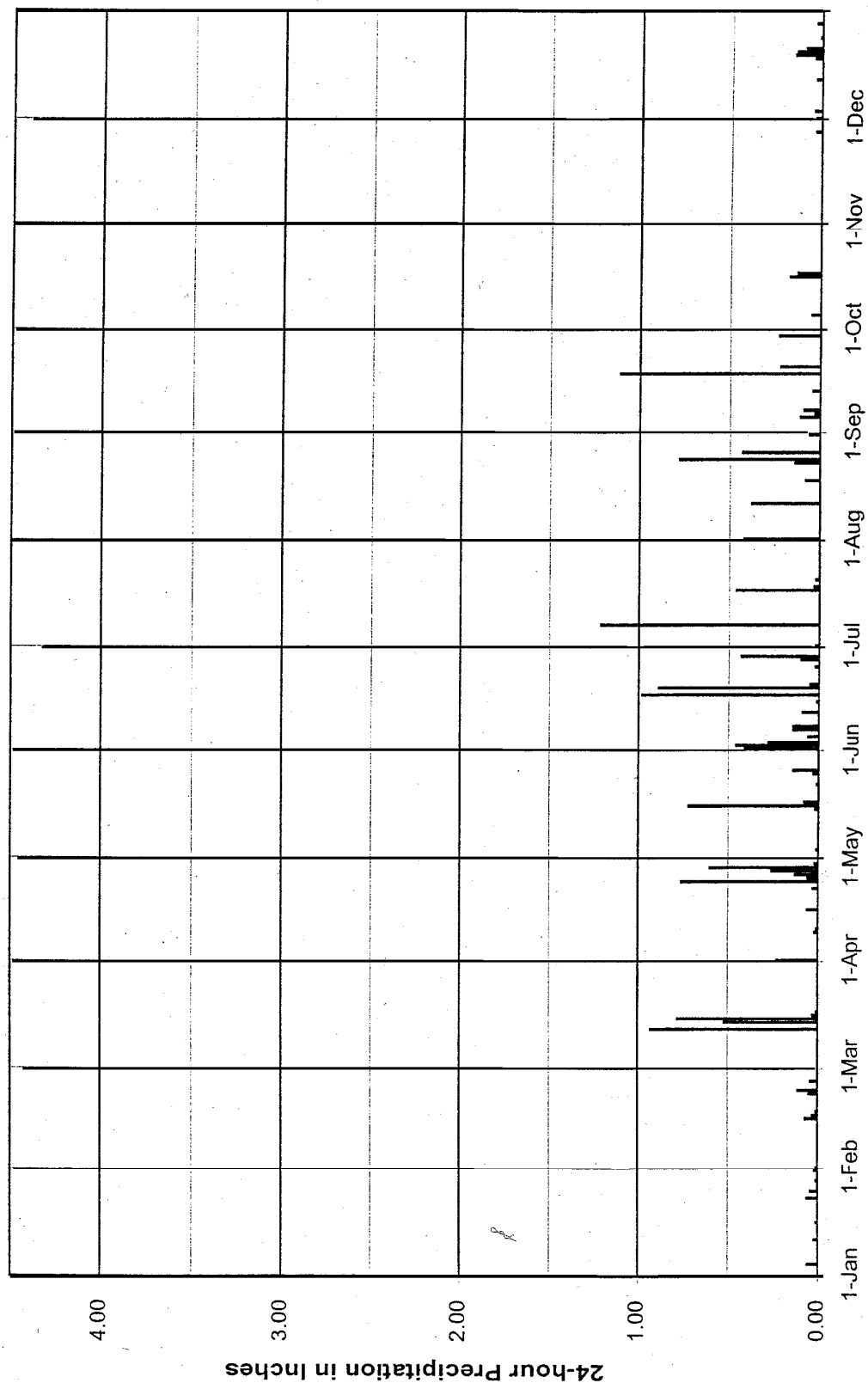
T 121 N, R 46 W  
SW 1/4, Section 26  
Big Stone County, MN

SECTION 00830

ATTACHMENT 4

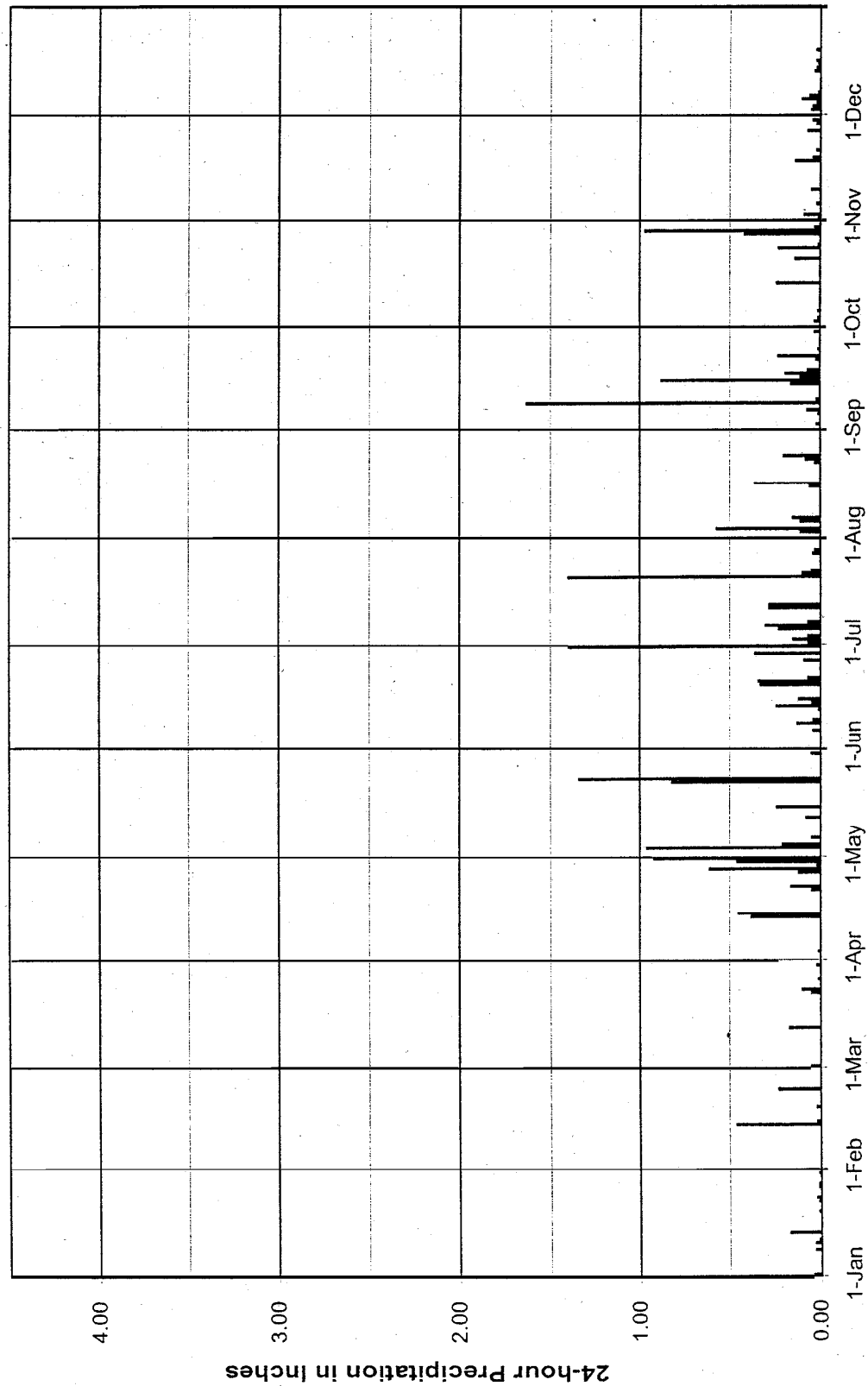
LOCAL PRECIPITATION

Grand Forks Airport Daily Observed Precipitation



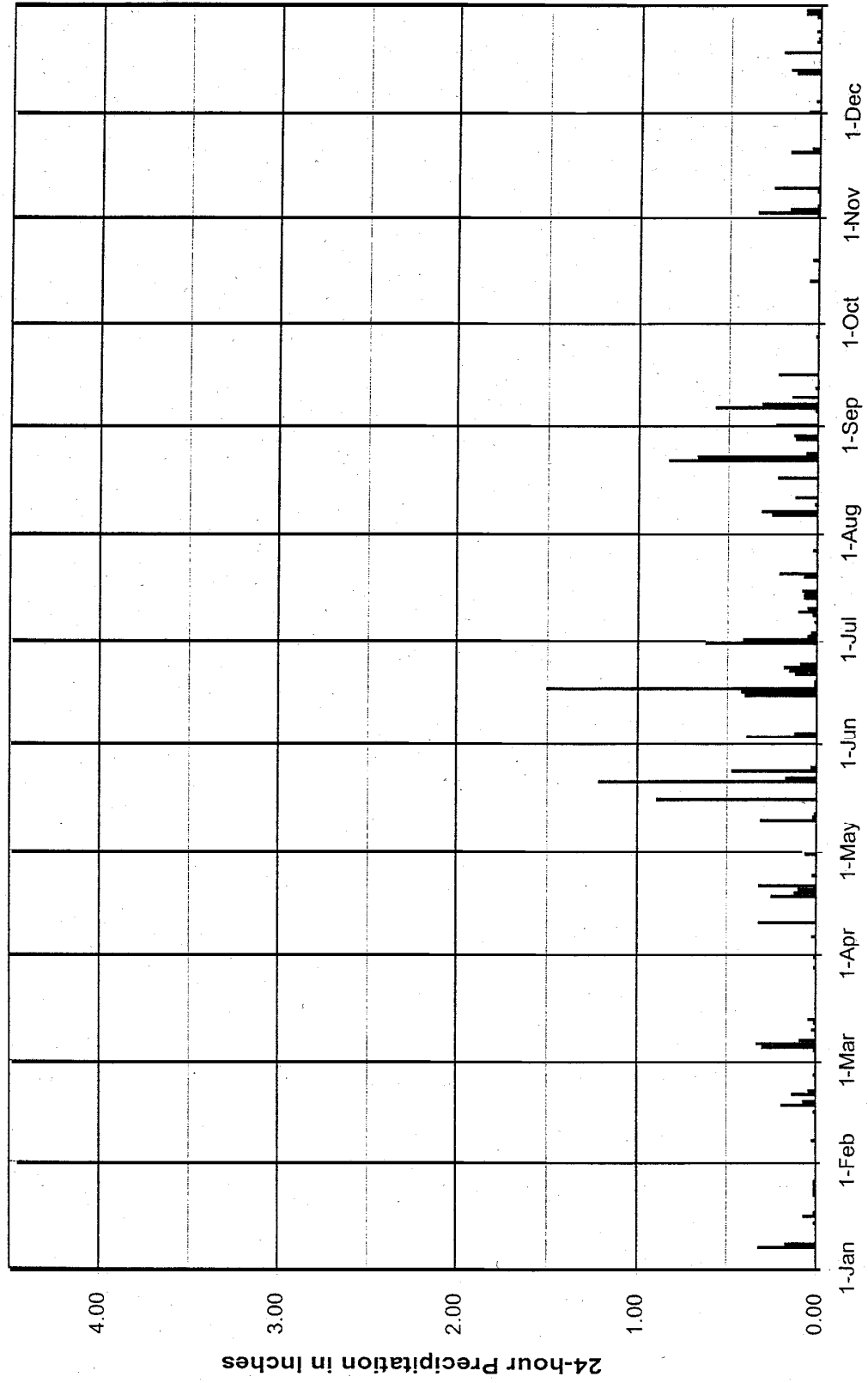
1990

Grand Forks Airport Daily Observed Precipitation



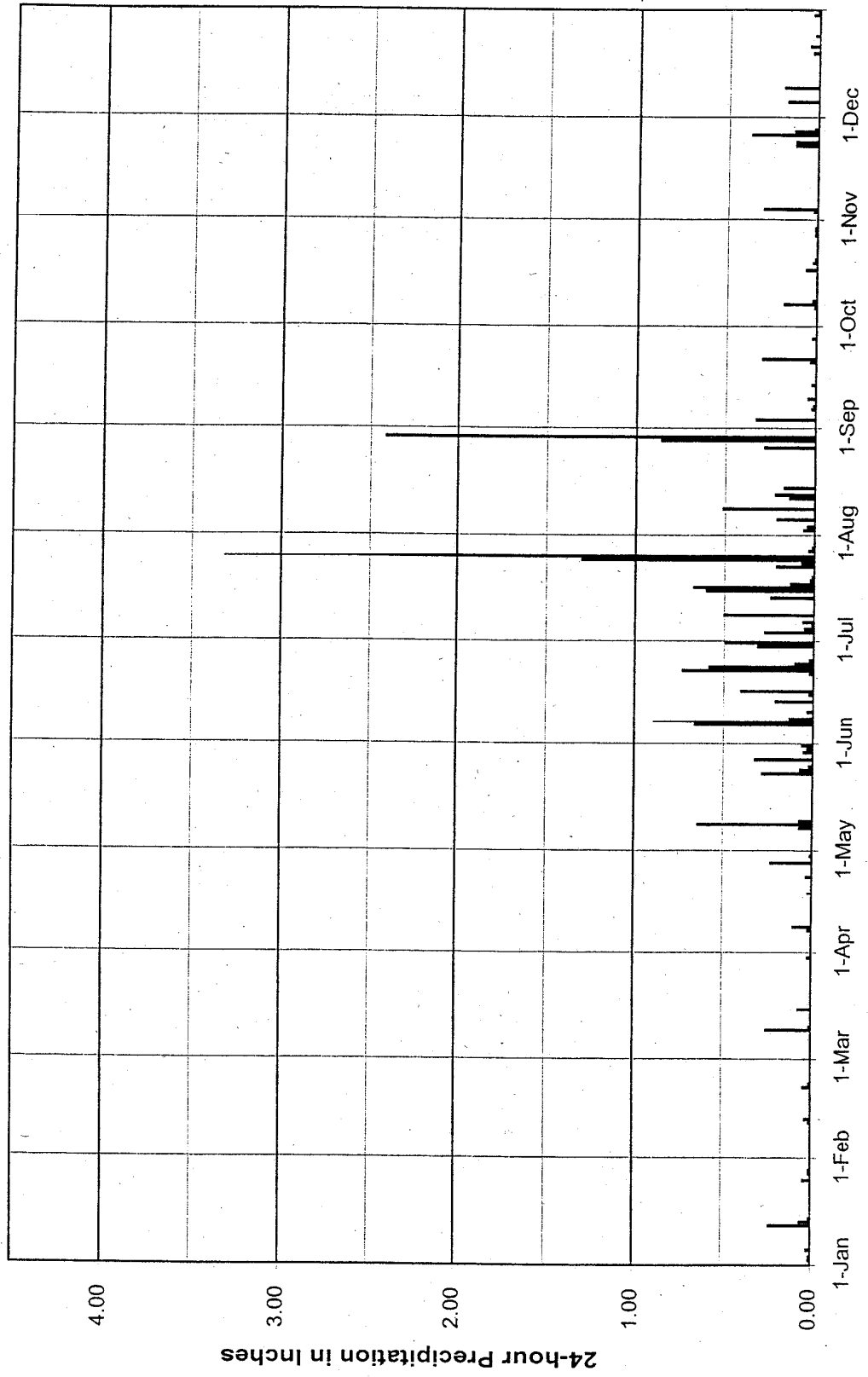
1991

Grand Forks Airport Daily Observed Precipitation



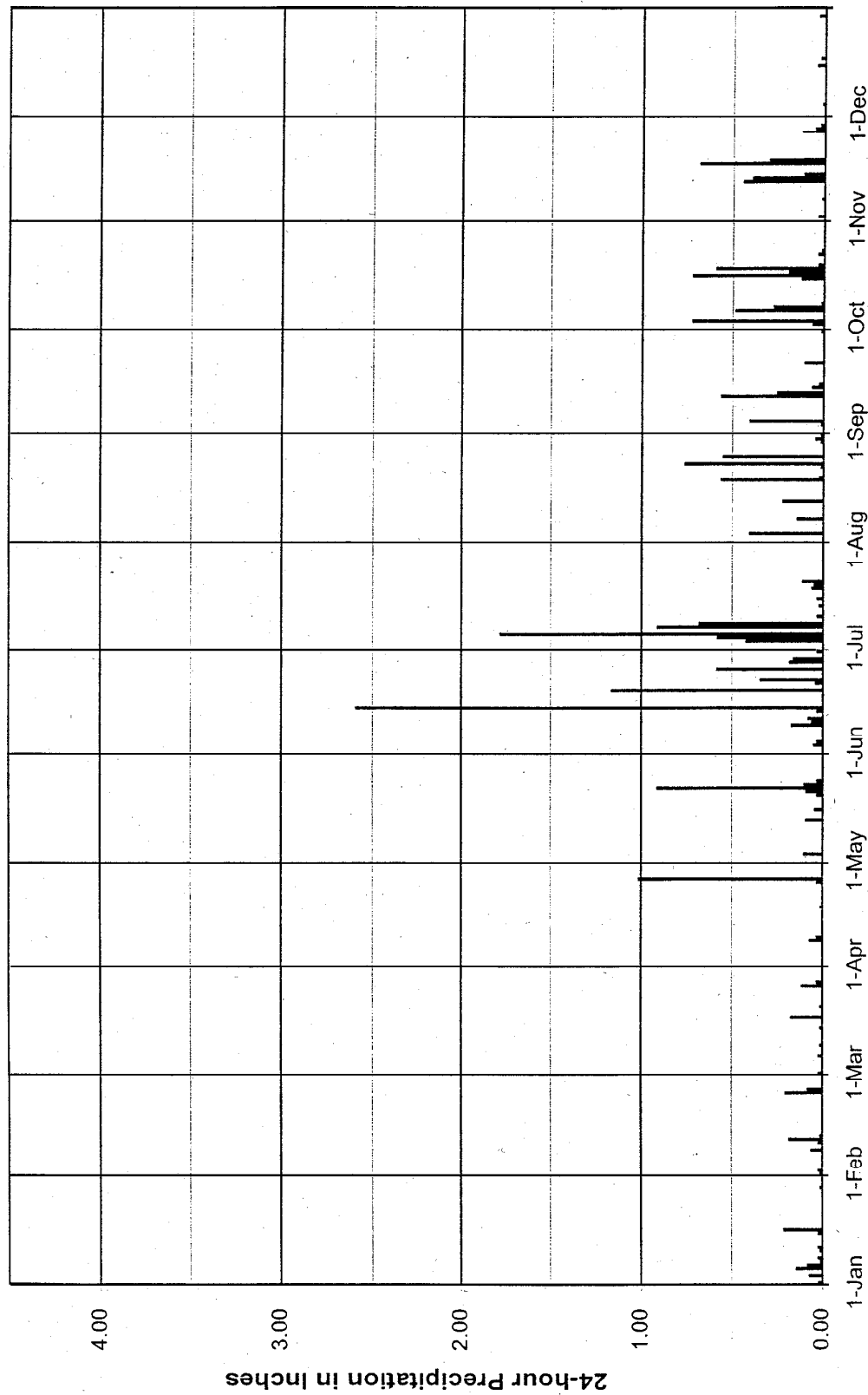
1992

Grand Forks Airport Daily Observed Precipitation



1993

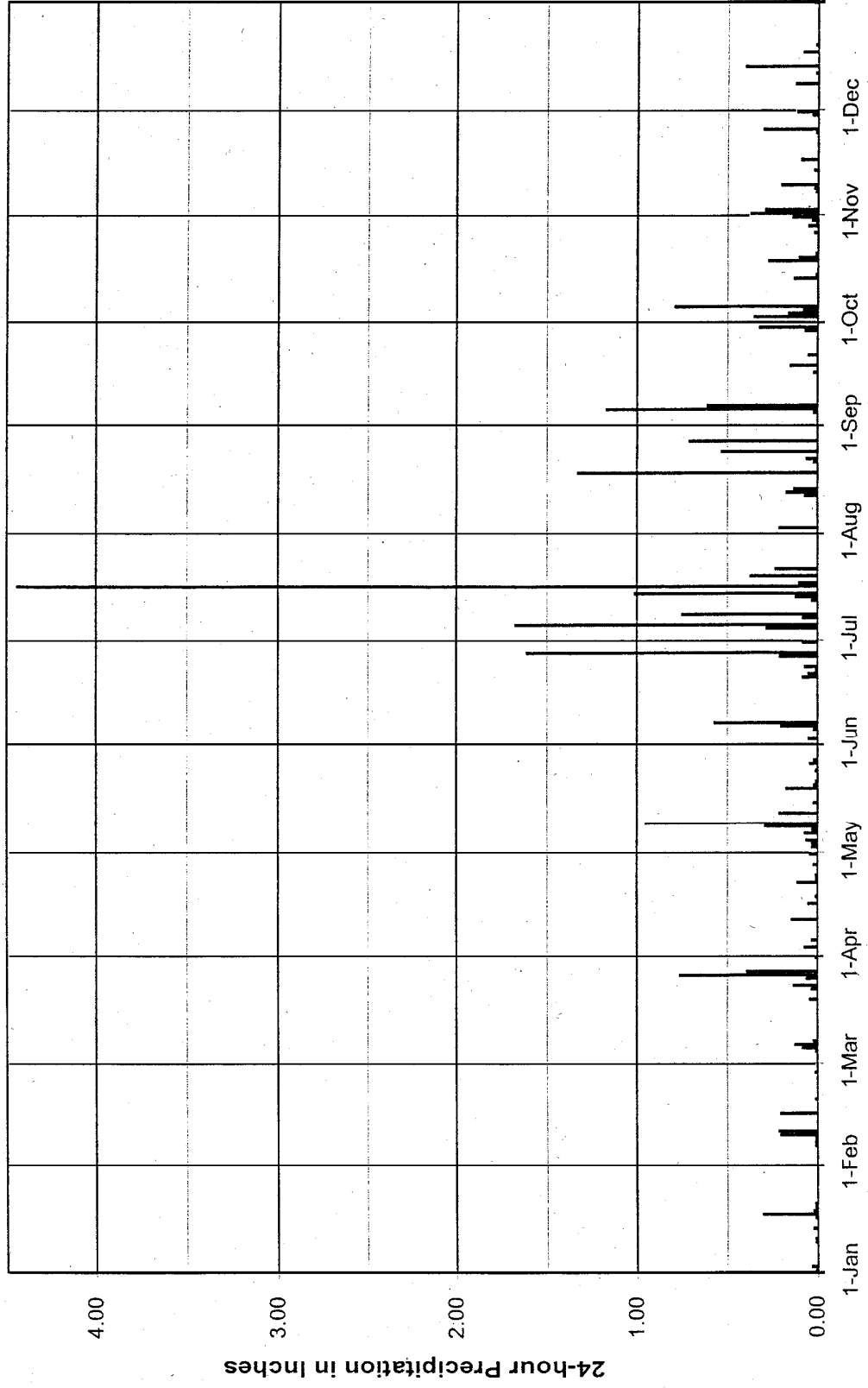
Grand Forks Airport Daily Observed Precipitation



1994

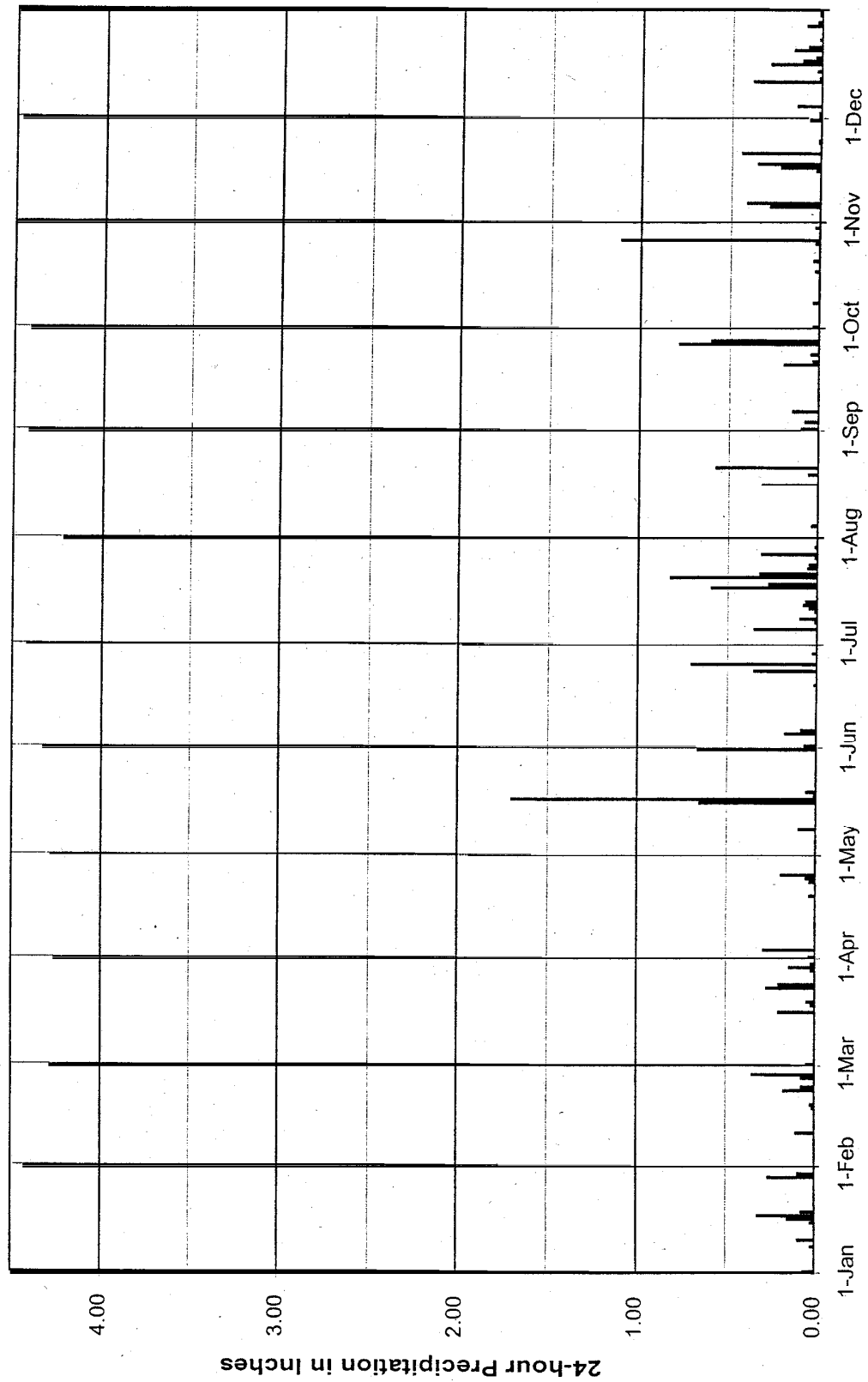


Grand Forks Airport Daily Observed Precipitation



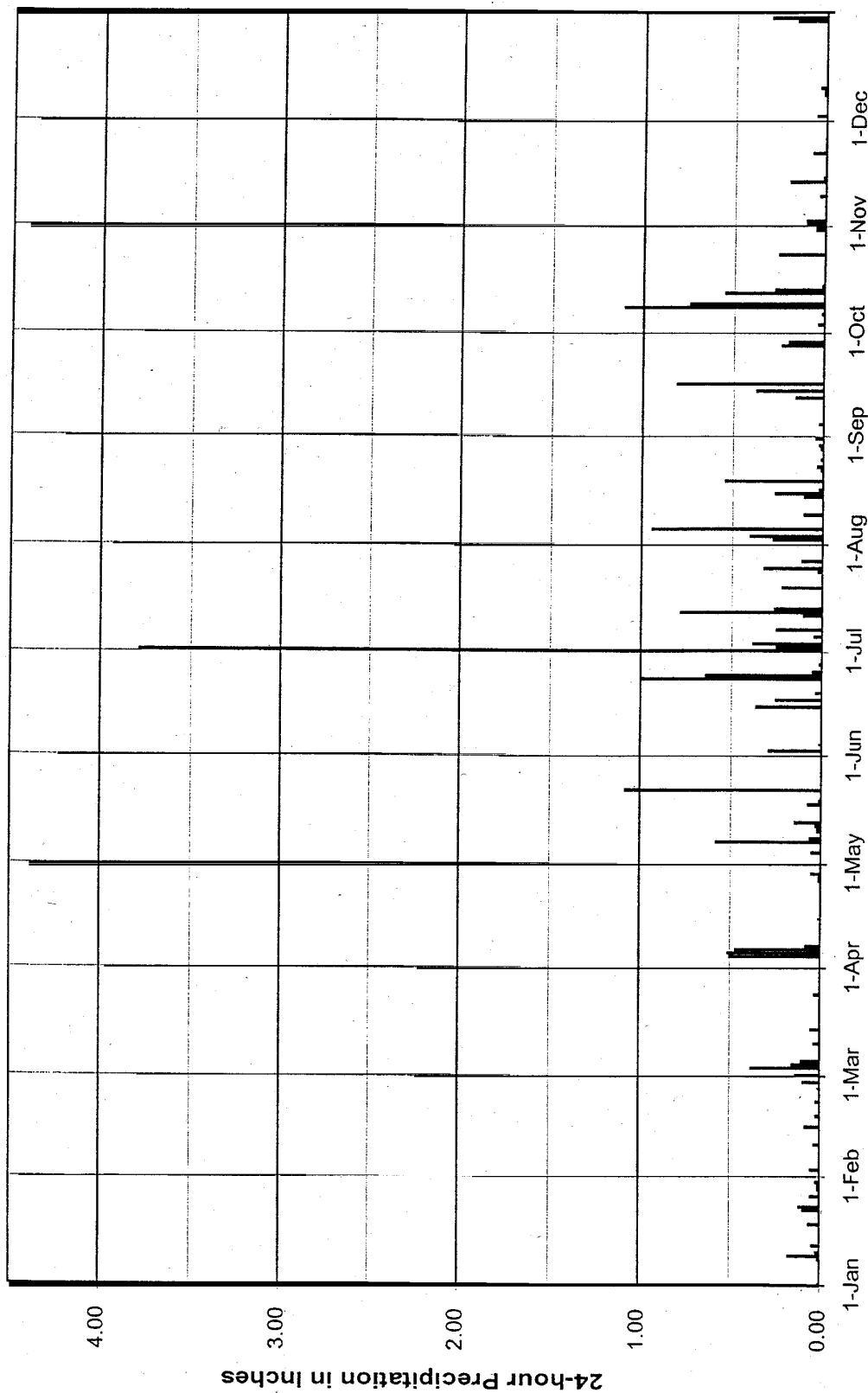
1995

Grand Forks Airport Daily Observed Precipitation



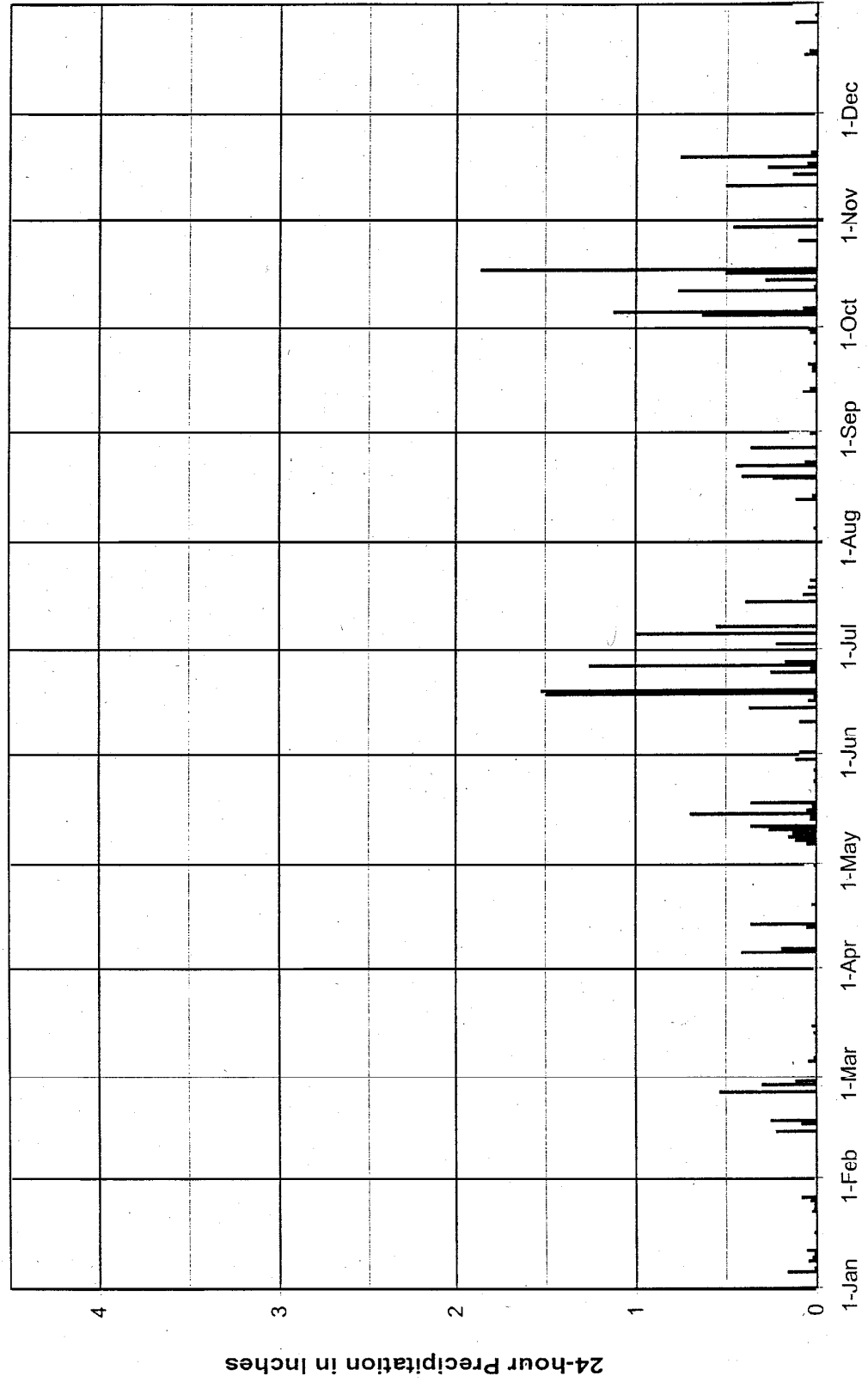
1996

Grand Forks Airport Daily Observed Precipitation



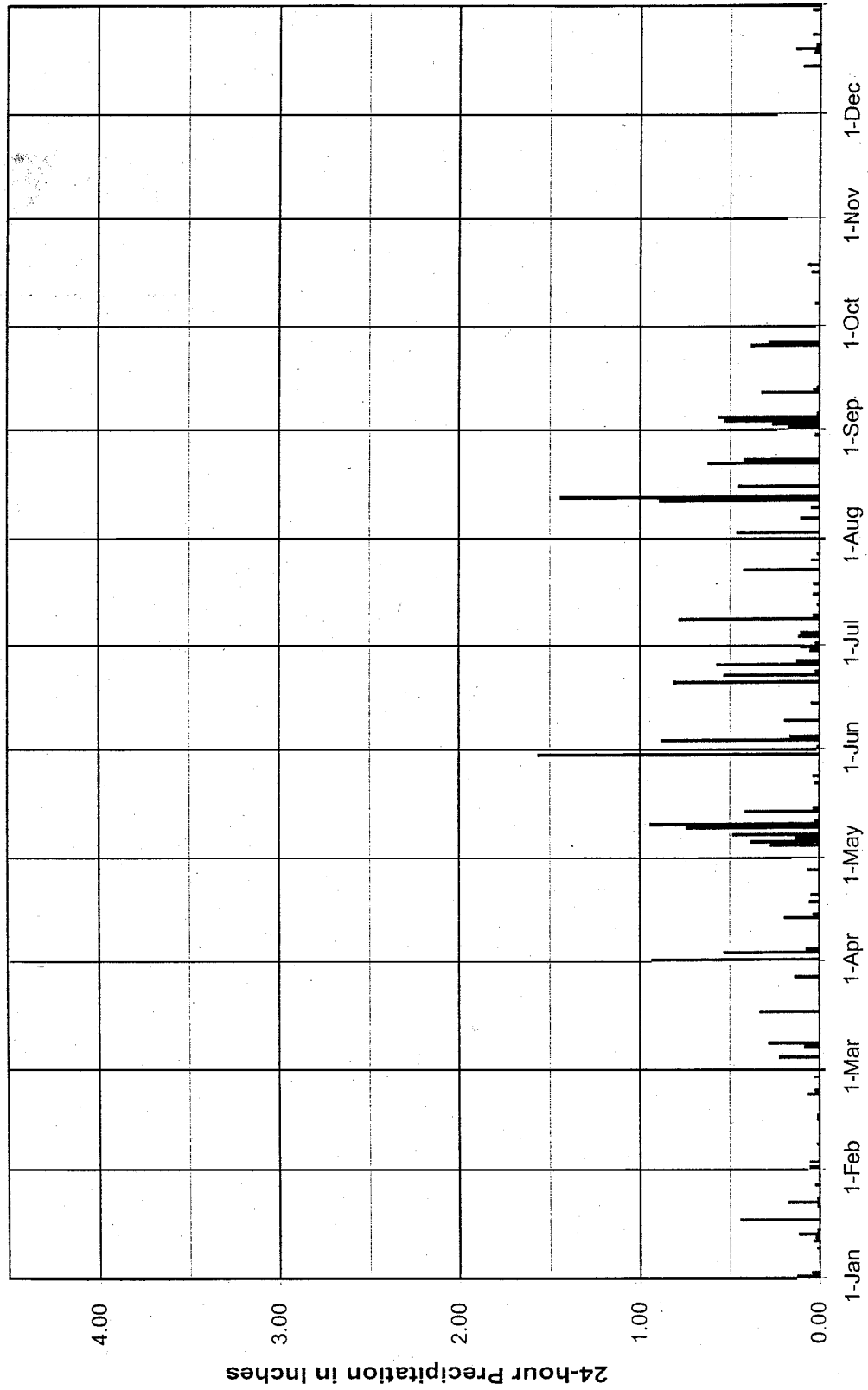
1997

Grand Forks Airport Daily Observed Precipitation



1998

Grand Forks Airport Daily Observed Precipitation



1999

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01000

GENERAL

PART 1 GENERAL

- 1.1 ORGANIZATION OF SPECIFICATIONS
- 1.2 SUBMITTALS
- 1.3 MEASUREMENT AND PAYMENT

PART 2 PRODUCTS

- 2.1 APPROVAL OF MATERIALS OR ALTERNATES
- 2.2 WARRANTIES

PART 3 EXECUTION

- 3.1 GROUNDS AND ROADWAYS
  - 3.1.1 Availability of Grounds
  - 3.1.2 Drainage Facilities
  - 3.1.3 Roadways
    - 3.1.3.1 Traffic Hazards
    - 3.1.3.2 Haul Routes
    - 3.1.3.3 Road Closures
- 3.2 DISPOSAL OF DEBRIS AND WASTE
  - 3.2.1 Disposal Offsite For Useful Purposes
  - 3.2.2 Disposal In A Locally Operated Sanitary Landfill
  - 3.2.3 Disposal of Solid Construction Debris and Waste
- 3.3 EXISTING UTILITIES
  - 3.3.1 Work by Others
  - 3.3.2 Buried Utilities
  - 3.3.3 Interruption of Services
  - 3.3.4 North Dakota One Call Excavation Notice System
- 3.4 SCHEDULING
  - 3.4.1 General
  - 3.4.2 Notification
  - 3.4.3 Work Hours
  - 3.4.4 Construction Sequencing
- 3.5 CONSTRUCTION RESTRICTIONS
  - 3.5.1 Blasting
  - 3.5.2 Protection of Trees
    - 3.5.2.1 Restoration of Damaged Trees
  - 3.5.3 Pavement Removal and Replacement
  - 3.5.4 Borrow and Disposal Areas
  - 3.5.5 Contaminated Materials
  - 3.5.6 Accident Prevention Plan
  - 3.5.7 Work In Vicinity of River Banks
  - 3.5.8 Stockpile Areas
- 3.6 GOVERNMENT-FURNISHED EQUIPMENT
  - 3.6.1 General
    - 3.6.1.1 Storage Location and Contact
    - 3.6.1.2 Government-Furnished Equipment List

## Grand Forks Phase 2 Levees

- 3.6.2 Delivery and On-Site Storage
- 3.7 OTHER CONTRACTS
- 3.8 SHORING
  - 3.8.1 General
  - 3.8.2 Responsibility
  - 3.8.3 Removal
- 3.9 DEWATERING OPERATIONS
  - 3.9.1 Scope
  - 3.9.2 Payment
  - 3.9.3 Requirements
    - 3.9.3.1 Design
    - 3.9.3.2 Regulations
    - 3.9.3.3 Operation
    - 3.9.3.4 Removal
  - 3.9.4 Geologic Information and Hydrologic Information
  - 3.9.5 Specific Requirements for Wells
    - 3.9.5.1 Screens
    - 3.9.5.2 Setback
    - 3.9.5.3 Roads and Levees
  - 3.9.6 Dewatering Plan
  - 3.9.7 Liability
  - 3.9.8 Related Work
  - 3.9.9 Surface Water Management During Construction
- 3.10 SEWAGE WATER DISPOSAL
- 3.11 SURVEYS
  - 3.11.1 Field Layout
    - 3.11.1.1 Alignment Changes
  - 3.11.2 Utility As-builts
- 3.12 PRECONSTRUCTION DAMAGE SURVEY
  - 3.12.1 Contacting Prior to Preconstruction Damage Survey
  - 3.12.2 Preconstruction Structure Surveys
  - 3.12.3 Preconstruction Condition Surveys
  - 3.12.4 Preconstruction Survey Reports
  - 3.12.5 Contractor Responsibility

-- End of Section Table of Contents --

SECTION 01000

GENERAL

PART 1 GENERAL

1.1 ORGANIZATION OF SPECIFICATIONS

The specifications which govern the materials and equipment to be furnished and the work to be performed under this contract are listed in the Table of Contents. No attempt has been made in the specifications to segregate work to be performed by any trade, craft, or subcontractor. Any segregation between the trades or crafts shall be solely a matter for agreement between the Contractor, Contractor's employees, and subcontractors.

1.2 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Utility As-Builts; FIO

The Utility As-Builts are described under paragraph SURVEYS.

SD-08 Statements

Designated landfill; GA

The Contractor shall select the locally operated landfill as described in paragraph DISPOSAL OF DEBRIS AND WASTE.

Dewatering plan; FIO

The submittal requirements are described in paragraph DEWATERING OPERATIONS.

Shoring plan; FIO

The submittal requirements are described in paragraph SHORING.

1.3 MEASUREMENT AND PAYMENT

The Contractor shall be responsible for the work of this section, without any direct compensation being made other than the payment received for contract line items on the bidding schedule.

PART 2 PRODUCTS

2.1 APPROVAL OF MATERIALS OR ALTERNATES

Requests for approval of materials and products, or substitutes thereof, will not be considered prior to award of the contract.



## 2.2 WARRANTIES

Any items that are submitted for review or approval of the Contracting officer should include a copy of the manufacturer's standard warranty if one is available.

## PART 3 EXECUTION

### 3.1 GROUNDS AND ROADWAYS

#### 3.1.1 Availability of Grounds

The boundary limits of the grounds made available for the Contractor's use during the life of the contract are shown on the drawings. Any additional rights-of-way or grounds desired by the Contractor shall be obtained by the Contractor at its own expense, and copies of agreements for the use of such rights-of-way shall be furnished to the Contracting Officer before entering thereon. Such agreements shall clearly relieve the Government of any responsibility for damages resulting from the use of the grounds.

#### 3.1.2 Drainage Facilities

Insofar as natural drainage from the protected areas is obstructed by contract operations, it shall be the Contractor's responsibility to make adequate provision for accommodating such drainage in a satisfactory manner during the life of this contract, either by temporary means or by use of the permanent construction and operation of the permanent facilities.

#### 3.1.3 Roadways

##### 3.1.3.1 Traffic Hazards

When continuous haul operations or other condition created by the Contractor's operations result in interference or hazard to traffic on streets and highways, beyond that of ordinary public usage, the Contractor shall erect warning signs and provide flagging services as necessary to safeguard the public as required in Section 01500 TEMPORARY CONSTRUCTION FACILITIES.

##### 3.1.3.2 Haul Routes

Haul routes shall be limited to concrete roads. Hauling will not be allowed on bituminous roads without prior written approval of the Contracting Officer.

The Contractor shall be responsible for securing all permits required along haul routes. The Contractor shall be the sole permittee and shall be responsible for meeting all obligations of the permits. A copy of each permit shall be submitted to the Contracting Officer. The Contractor, as between the Government and the Contractor, has sole responsibility for damage or deterioration of the Contractor's haul routes. Dust control shall be provided as stated in Section 01410 ENVIRONMENTAL PROTECTION.

##### 3.1.3.3 Road Closures

The Contractor shall be responsible for coordinating road closures and detours with the appropriate jurisdictions.

### 3.2 DISPOSAL OF DEBRIS AND WASTE

The Contractor's attention is directed to Section 01410 ENVIRONMENTAL PROTECTION and to the following Section 00700 CONTRACT CLAUSES: PERMITS AND RESPONSIBILITIES; PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES, EQUIPMENT, AND IMPROVEMENTS; OPERATIONS AND STORAGE AREAS; and CLEANING UP. Burning will not be permitted at the project site and debris or waste shall not be left on the site. Disposal of clearing and grubbing debris shall be by one of the following methods:

#### 3.2.1 Disposal Offsite For Useful Purposes

In the interest of conservation, it is required that the Contractor make a reasonable effort to dispose of the material offsite for some useful purpose. Timber may be cut into convenient lengths and utilized for making saw logs, posts, cordwood, wood chips for paper making or other uses, or other similar use.

#### 3.2.2 Disposal In A Locally Operated Sanitary Landfill

Contractor shall dispose of sanitary landfill material in the City of Grand Forks landfill. The Contractor shall secure the required permits for disposal and provide copies of the permit to the Contracting Officer. The Contractor shall be responsible for all tipping fees.

#### 3.2.3 Disposal of Solid Construction Debris and Waste

Disposal of solid construction debris and waste shall consist of removal from Government property and disposal in compliance with Federal, state, and local requirements for solid waste disposal. Contractor shall dispose of solid construction debris and waste material in the City of Grand Forks landfill. The Contractor shall be responsible for all tipping fees.

### 3.3 EXISTING UTILITIES

#### 3.3.1 Work by Others

Relocation of existing utilities will be the responsibility of the utility companies. This includes moving or lowering such services as gas line, underground power and communication lines, sanitary sewer, water main, and overhead power lines.

The Contractor shall coordinate construction activities with relocation requirements of utility companies. The Contractor shall make payment to the utility companies for all services, fees, and permits required to relocate and reestablish service for utilities relocated for convenience of the Contractor's operations. The Contractor shall be responsible for all costs related to protecting existing and relocated utilities. The Contractor shall coordinate with the utility representatives listed in Attachment A following this Section.

The City of Grand Forks and private utility companies are responsible for relocating existing utilities that penetrate through or under the new levees and closure structures and existing utilities that conflict with new facilities constructed under this contract. The Contractor shall coordinate with the City of Grand Forks and the utility companies to ensure

that relocation of the utilities is performed without causing delay to the project.

### 3.3.2 Buried Utilities

The approximate locations of known existing buried utilities are shown on the drawings to the extent of available information at the time the drawings were prepared. (In general, no service connections are shown.) Prior to commencing excavation, the Contractor shall accurately locate all such installations. In the event the Contractor damages any existing utility lines, report thereof shall be made immediately to the Contracting Officer. If the Contracting Officer determines that repairs shall be made by the Contractor, such repairs shall be performed immediately. The costs associated with repairs shall be borne by the Contractor.

### 3.3.3 Interruption of Services

Utility services shall not be interrupted except for brief periods to facilitate cut-ins. The Contractor shall provide temporary service and shall relocate existing utilities as required to construct the work shown and insure uninterrupted service. If interruption of services is unavoidable, the Contractor shall request approval in writing at least 30 calendar days prior to the proposed interruption. This submittal shall fully describe all details of proposed interruption and the reasons why alternatives are not feasible. The Contractor shall further coordinate with the owner of the utility and notify affected consumers at least 10 calendar days in advance of interruption of services. The Contracting Officer will not in general approve proposals which require interruption of services for more than 4 continuous hours.

### 3.3.4 North Dakota One Call Excavation Notice System

For contract work performed within the State of North Dakota, the Contractor shall meet the requirements of North Dakota Statutes, Chapter 42-23 "One Call Excavation Notice System." The North Dakota One Call notification center telephone numbers are:

|             |              |
|-------------|--------------|
| Hotline     | 800-795-0555 |
| Main Office | 701-223-9380 |

## 3.4 SCHEDULING

### 3.4.1 General

It shall be the responsibility of the Contractor to schedule and execute the work, incorporating the necessary requirements set forth in these specifications. The Contractor shall develop and submit a schedule in accordance with Section 00800 SPECIAL CONTRACT REQUIREMENTS: SCHEDULES FOR CONSTRUCTION CONTRACTS.

### 3.4.2 Notification

The Contractor shall inform the Government in writing within 5 days after receipt of notice to proceed and before work begins as to which hours of the day and days of the week work under this contract will be performed. The Contractor shall notify the Government at least 24 hours before work is to be conducted on overtime, in multiple shifts, on weekends, or on Federal Government holidays.

### 3.4.3 Work Hours

The City of Grand Forks has a noise ordinance. In accordance with the noise ordinance, work on the project shall not be performed earlier than 6:30 AM and not later than 10:00 PM.

### 3.4.4 Construction Sequencing

Construction scheduling and sequencing is the responsibility of the Contractor. The Contractor shall incorporate the following sequencing restrictions into the schedule:

- a. The level of flood protection at the close of the 2002 construction season shall be equal to or greater than what exists in the Notice-to-Proceed for the project.
- b. Existing storm sewer outfalls to the Red River shall be maintained in service until new discharge chambers and outfalls are completed and ready for service.
- c. The City's water intake and control building located at Lincoln Drive and Almonte Avenue shall be maintained in service until May 1, 2004. If intake line is removed prior to this date, it shall be replaced with a temporary 18 inch diameter line until May 1, 2004. City shall be notified a minimum of 2 weeks prior to demolition to allow for salvage of equipment in control building. Temporary line shall be plugged once out of service. Intake pipe at river shall be plugged once temporary line is out of service.

## 3.5 CONSTRUCTION RESTRICTIONS

### 3.5.1 Blasting

Blasting will not be permitted.

### 3.5.2 Protection of Trees

Trees to be protected shall be determined and staked by the Contracting Officer. The following measures shall be implemented for tree protection and shall be addressed in the Environmental Protection Plan required under Section 01410 ENVIRONMENTAL PROTECTION:

- a. The trees shall be protected from wounds to the bark and foliage.
- b. The critical root zone shall be protected from compaction and grading.
- c. Changes in temporary site drainage and ponding shall be minimized to the extent possible that it effects the protected trees.

The critical root zone of trees designated to be protected shall be surrounded by a high visibility fence 4 feet in height, supplied and erected by the Contractor. The critical root zone shall be defined by an area extending 1.5 feet radius from each tree for each inch of Diameter at Breast Height (DBH). The fence shall be securely erected and installed prior to any movement through the project site by construction vehicles or equipment, and remain in place until construction and clean-up are completed. The critical root zone shall remain free of all construction activities including trenching, staging, stockpiling and storage of

materials. Vehicles and equipment shall not drive or park within the critical root zone. Variation to the critical root zone size or configuration will only be permitted where it is absolutely necessary for construction of the project, and requires approval of the Contracting Officer. Short duration alterations of the critical root zone involving wood chips and limited equipment travel shall be submitted in writing for approval.

The Contractor shall not operate equipment in vegetated areas outside the work limits.

#### 3.5.2.1 Restoration of Damaged Trees

Any existing tree designated to be protected that is damaged by the Contractor's operations shall be replaced. Trees will be considered damaged if the critical root zone in cohesive soils is compacted, if there are significant wounds that could contribute to rot, or if distress (evident by reduced growth or other observations of distress documented by a forester) is observed prior to closing the contract. Trees shall be replaced in kind on a caliper inch per caliper inch basis (DBH) (i.e. one 6-inch red oak shall be replaced with two 3-inch red oaks, three 2-inch red oaks, or six 1-inch red oaks). Replacement trees shall be planted in accordance with Section 02930 EXTERIOR PLANTING and guaranteed with the Contractor's standard warranty. Replacement tree size and location will be determined and staked by the Contracting Officer. Repair by pruning, aeration, soil conditioning, or other recommendation from a qualified forester will be considered as substitution for replacement by the Contracting Officer.

#### 3.5.3 Pavement Removal and Replacement

Where roads are cut, removed, or otherwise damaged in the prosecution of the work the Contractor shall replace all pavements or other surfacings so removed or damaged to their preconstruction condition, unless otherwise specified or indicated. After backfill is completed on paved streets, a temporary surface shall be laid down and the street opened to traffic in order to provide access to abutting property. Restoration of the original street surface construction shall be completed no later than 60-calendar days after starting excavation. Should weather conditions preclude the restoration of the original surface material, temporary resurfacing utilizing a bituminous mixture shall be installed with the final surface constructed no later than June 1 of the following construction season.

#### 3.5.4 Borrow and Disposal Areas

Each borrow and disposal area is subject to the approval of the Contracting Officer. Proposed borrow areas which involve the excavation of wetlands or wooded areas will not be approved by the Contracting Officer. Disposal areas which involve the placement of materials in wetlands or floodplain areas will require a minimum of 7-calendar days for review and approval or disapproval.

#### 3.5.5 Contaminated Materials

The Contractor shall comply with all applicable federal, state and local requirements if contaminated soils, materials, and/or groundwater is/are encountered during construction activities within the contract project work limits. If contaminated materials/areas are encountered, the Contractor shall immediately notify in writing the following regarding such: the

Contracting Officer, and each appropriate federal, state, and local agency.

All work associated with implementation of a contingency plan and handling and/or disposal of contaminated soils, materials, and/or groundwater shall be performed in accordance with CONTRACT CLAUSE: CHANGES.

#### 3.5.6 Accident Prevention Plan

The Contractor's accident prevention plan, as required in CONTRACT CLAUSES: ACCIDENT PREVENTION, shall specifically address site safety and monitoring with regards to possible encounters with contaminated soils, materials, and/or groundwater. The Contractor's accident prevention plan shall also include a contingency plan to be implemented immediately upon encountering contaminated soils, materials, and/or groundwater.

#### 3.5.7 Work In Vicinity of River Banks

Contractor shall not use heavy equipment within 100 feet of the existing river banks, except at barge loading staging areas. Contractor shall not stockpile materials within 500 feet of the existing river banks without prior approval of the Contracting Officer.

#### 3.5.8 Stockpile Areas

Contractor shall notify the City of Grand Forks and the Contracting Officer a minimum of 5 days before hauling riprap to stockpile areas.

### 3.6 GOVERNMENT-FURNISHED EQUIPMENT

#### 3.6.1 General

The work of this contract includes installing equipment furnished by the Government. The Contractor shall be responsible for coordinating with each equipment supplier as necessary to fully understand the furnished equipment and documentation in order to correctly install Government furnished equipment in each pump station. The Government-furnished equipment is listed below. The Contractor shall be responsible for loading and unloading, transporting, installing, and testing the Government-furnished equipment. The Government-furnished equipment shall be transported to the project site from the storage location. The equipment will be available at the beginning of this contract.

##### 3.6.1.1 Storage Location and Contact

The Government furnished equipment will be stored at the water treatment facility at the address listed below. The storage area is in a locked facility. The Contractor shall coordinate with the Contracting Officer's Representative to arrange access to the Government furnished equipment.

503 South 4th Street  
Grand Forks, ND 58201

##### 3.6.1.2 Government-Furnished Equipment List

Government-furnished equipment is listed below:

###### Pump Station C1:

500 kw generator  
3 pumps at 15,000 gpm

## Grand Forks Phase 2 Levees

- 1 sump pump at 1000 gpm
- Access hatches for all submersible pumps
- Transfer Switch
- Pump Controls
- Pump Starters
- SCADA System

### Pump Station D3:

- 4 pumps at 15,000 gpm each
- 1 sump pump at 1000 gpm
- 500 kw generator
- 200 kw generator
- Generator transfer switches (200 kw and 500 kw)
- Access hatches for all submersible pumps
- Pump Controls
- Pump Starters
- SCADA System

### Pump Station E1:

- 250 kw generator
- 3 pumps at 6000 gpm
- 1 sump pump at 1000 gpm
- Access hatches for all submersible pumps
- Transfer Switch
- Pump Controls
- Pump Starters
- SCADA System

### 3.6.2 Delivery and On-Site Storage

Equipment shall be inspected for damage, loaded, transported, and unloaded with a minimum of handling. The Contractor shall notify the Contracting Officer of any damaged equipment prior to loading and transporting from the storage location. The equipment shall not be stored directly on the ground and shall be protected from any environment that would result in damage or deterioration to the equipment. The Contractor shall not remove any equipment from the Government storage facility unless installation in the pump stations is scheduled to occur within 15 calendar days of removing the Government furnished equipment from the storage facility. The Contractor shall complete installation of the Government furnished equipment within 15 calendar days of removal from the storage facility.

### 3.7 OTHER CONTRACTS

The Contractor shall coordinate with other contractors in the performance of the work and schedule such work to provide for a minimum of delays and interferences. Coordination shall be through the Contracting Officer. Work listed below is currently required under separate contract or is scheduled to be awarded as a separate contract prior to completion of work under this contract. These contracts will be considered in the application of Section 00700 CONTRACT CLAUSE: OTHER CONTRACTS.

Contracts for work within the project limits will be performed by others concurrent with this project. Contracts for the Grand Forks Phase I Levees will be in effect during the life of this Contract (estimated completion June 2003). Work for Phase I will occur in or adjacent to the following reaches: Station 179+ to 189+, Station 237+ to 255+, and Station 317+ to

355+. The City of Grand Forks and utility companies will be working within the project limits to remove and relocate utilities in conflict with the project as described in paragraph EXISTING UTILITIES.

### 3.8 SHORING

#### 3.8.1 General

At locations where shoring is not specifically required by the contract documents to safeguard adjacent structures, the Contractor may at its own option employ shoring for protecting work areas within excavations in lieu of performing excavation to safe and stable side slopes. The Contractor shall construct all shoring required in performing the excavations. Shoring shall be constructed in accordance with the safety requirements of EM 385-1-1.

#### 3.8.2 Responsibility

The Contractor shall be responsible for design and maintenance of all shoring which the Contractor proposes to install. Plans and design computations for all shoring used shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES at least 30 days prior to installation.

#### 3.8.3 Removal

Unless otherwise authorized, all sheeting and bracing shall be removed when backfill is completed.

### 3.9 DEWATERING OPERATIONS

#### 3.9.1 Scope

The Contractor shall design, furnish, install and operate dewatering systems in the execution of the Contract work. The work involves drawdown of water table, shoring, and other related work. Surface drainage shall be controlled by rerouting storm water runoff or diverting natural drainage, as necessary.

#### 3.9.2 Payment

No separate payment will be made for dewatering on this project and compensation for all dewatering operations will be included in the respective contract items to which the work pertains.

#### 3.9.3 Requirements

Control of groundwater shall be accomplished in a manner that will provide suitable working conditions for construction, preserve the strength of the foundation soils, will not cause instability of excavations, and will not result in damage to existing structures. Suitable working conditions for construction will provide a dry or moist subgrade free of standing, percolating, or running water during placement and curing of concrete, and placement and compaction of backfill. Where necessary to these purposes, the water level shall be lowered in advance of excavation utilizing wells, wellpoints, or similar methods. For structure foundations, the water level (as measured in piezometers) shall be maintained a minimum of 2 feet below the prevailing excavation level.

##### 3.9.3.1 Design



The responsibility for the design of adequate dewatering protection, including shoring, pumping, and other dewatering facilities, shall rest with the Contractor. The design of the protection shall be in accordance with sound engineering practice, based on generally accepted methods and assumptions as approved. If conditions warrant, and if not otherwise specified in the contract documents, dewatering may consist of collection in sumps or trenches, and open pumping. Sumps, trenches and running water shall not jeopardize erosion or ground loss near foundations, pipes, or other structures. Open pumping will not be permitted if it results in boils, seepage in concrete placement areas, loss of fines, softening of the ground, instability of slopes, or interference with orderly progress of the construction.

#### 3.9.3.2 Regulations

Compliance with all regulations shall be incidental to the dewatering work. Disposal of water shall be in accordance with Section 01410 ENVIRONMENTAL PROTECTION and all applicable regulations. Well abandonment shall seal aquifers and confining layers in compliance with environmental regulations and permits.

#### 3.9.3.3 Operation

Upon installation and commencement of dewatering operations, the system shall be operated continuously (24 hours/day, 7 days/week) until the structure and backfill are completed to the groundwater elevation. The Contractor shall be responsible for maintaining the system.

#### 3.9.3.4 Removal

Upon completion of the work, well casing and screens shall be withdrawn, and all equipment shall be removed (including related temporary cofferdams, shoring, etc.)

#### 3.9.4 Geologic Information and Hydrologic Information

Ground water elevations shown on the boring logs are those encountered at the time the borings were taken. Because groundwater elevations are dependent upon hydrologic conditions, variations in the water table should be expected. For work near the Red River of the North, refer to the hydrographs included with the contract drawings. It shall be the Contractors responsibility to perform the necessary dewatering operations irrespective of the water elevations at the time of the work. However, nothing in this clause prohibits the Contractor from receiving a time extension under the Default clause, the Time Extensions for Unusually Severe Weather clause, or any other clause in this contract.

#### 3.9.5 Specific Requirements for Wells

##### 3.9.5.1 Screens

Wells and wellpoints shall be installed with suitable screens and filters so that continuous pumping of fines does not occur. Pumps shall discharge into a settling tank to check for movement of sand. Wells shall be sealed in accordance with State Health Department requirements.

##### 3.9.5.2 Setback

The following criteria shall be followed to the maximum extent possible. Where permanent site features restrict placement of dewatering devices, the Contracting Officer will allow a variance. Wellpoints shall be located a minimum horizontal distance away from structures (existing and proposed) equal to the depth of penetration below foundation elevation. Wells larger than 3 inches diameter shall be located a minimum horizontal distance away from structures equal to the depth of penetration below foundation elevation plus half the depth of penetration above foundation elevation.

#### 3.9.5.3 Roads and Levees

Wells larger than 3 inches diameter shall not be jetted through roadway and levee embankments. Wells larger than 3 inches diameter located on the up gradient side of levees, dikes, dams or floodwalls shall be screened without a gravel filter pack. These wells shall be abandoned by plugging the hole with a cement-bentonite grout. The screens shall include a loose end cap to allow removal of screen and casing without hole collapse.

#### 3.9.6 Dewatering Plan

At least 30 calendar days prior to commencing work on the installation or construction of dewatering protection, the Contractor shall submit for review by the Contracting Officer prints in triplicate showing plans and details of the type of construction, including shoring proposed for installation at each location. The design shall be in accordance with sound engineering practice as approved. This submittal data shall include computations covering the analysis and design layout, proposed methods of protection of construction work that would be subject to exposure to channel flows exceeding the dewatering protection capacity, type and spacing of dewatering devices, number and size of pumps and other equipment, together with a description of the installation and operating procedures, including relationship to the construction operations. The plan shall be reviewed and signed by a Registered Professional Engineer. The plan shall include the following items

- a. layout (including the relationship to site improvements and construction operations)
- b. type, sizes, depth and spacing of dewatering device
- c. number and capacity of pumps
- d. design assumptions, analysis methods, and calculations
  - 1) justification for pump capacity
  - 2) justification for slot size on screens
  - 3) justification for screen intake area
  - 4) justification for filter pack gradation
- e. description of installation equipment
- f. description of operating procedures
- g. description of discharge point (weirs, sedimentation basin, etc.)
- h. type and location of monitoring equipment

i. removal and abandonment plans

3.9.7 Liability

Government review of the proposed dewatering system will not relieve the Contractor of full responsibility for the adequacy of the dewatering operations. The Contractor shall be responsible for dewatering effects on adjacent properties, including but not limited to blockage of easements, erosion or sedimentation of ditches, and encroachment onto private property by flooding from pump outlets and sedimentation basins.

3.9.8 Related Work

Shoring, trench support systems, cofferdams and diversion structures shall be coordinated with the dewatering effort to provide safe and reliable conditions.

3.9.9 Surface Water Management During Construction

Red River Flooding: Red River of the North is prone to experience extremely high flood stages of relatively long duration. The Contractor shall be responsible for monitoring local weather conditions and flow conditions in order to anticipate flooding conditions prior to their occurrence. The Contractor shall keep the Contracting Officer informed regarding all flooding conditions on the Red River of the North.

The Contractor should satisfy itself before submitting its bid as to hazards that arise from weather conditions and flooding. Precipitation data and Red River of the North rating curves and hydrographs are included in the contract drawings and as attachments in Section 00830 ATTACHMENTS. These references include:

- a. Grand Forks Airport Precipitation (Attachment 4)
- b. Red River of the North Elevation-Discharge Rating Curve (Contract Drawings)
- c. Mean Daily Flows for Red River of the North, Water Years 1978 and 1979 and 1991 through 1998 (Contract Drawings)
- d. Red River of the North Monthly Flow Duration Curves (Contract Drawings)

3.10 SEWAGE WATER DISPOSAL

The Contractor's methods for disposal of sanitary sewage shall meet applicable local, state, and federal requirements.

3.11 SURVEYS

3.11.1 Field Layout

The Contractor shall layout the work from the Government established bench marks in accordance with Section 00800 CONTRACT CLAUSE: LAYOUT OF WORK. The construction of each feature of work shall follow the alignments as indicated on the drawings. The Contractor shall have in place, at least 7 calendar days prior to commencing construction operations, sufficient stakes and markings to enable the Contracting Officer to observe the field

layout of the alignment and limits of each feature of work. For each feature of work, these stakes shall define areal limits such that the Contracting Officer can easily determine, without additional surveys, if alignment and/or limit adjustments need to be made. For embankments, levees, floodwalls, and similar work, these stakes shall define centerline, stationing, outermost fill/cut limits, and work limits. For buildings and similar work, the building corners and grid lines shall be staked. General site work shall be staked to define staging areas, storage areas, and other area limits as directed. The Contracting Officer may waive these requirements for certain areas. The layout shall be sufficient for the Contracting Officer to mark trees, vegetation and other features to be left undisturbed. No work shall take place without approval of field layout by the Contracting Officer.

#### 3.11.1.1 Alignment Changes

The Government reserves the right to make changes in the alignment of any feature of work as may be found necessary during the course of the contract. If it becomes necessary, through no fault of the Contractor, to abandon alignment, location or feature on which work has been done, an equitable adjustment for completed work will be made. No alignment changes or abandonment shall take place without prior written notice from the Contracting Officer.

#### 3.11.2 Utility As-builts

An as-built field survey of all utilities shall be conducted after installation to determine the final locations and elevations of all utility structures such as manholes, catch basins, gate valves, cleanouts, service connections, and other special controls or structures. Final elevations shall be determined for all sewer inverts and castings. Locations shall be shown using the same convention as the original contract drawings (typically project coordinates).

#### 3.12 PRECONSTRUCTION DAMAGE SURVEY

Prior to the start of contract construction operations in an area, the Contractor shall conduct preconstruction property damage surveys. These surveys shall be performed initially and repeated later as required.

##### 3.12.1 Contacting Prior to Preconstruction Damage Survey

The Contractor shall have both letter and personal contact with residents, institutional operators, and/or business establishments that are within the project work limits or near enough for ground and noise vibrations to be considered objectionable. This contact shall be made prior to beginning potential vibration-producing activities. The Contractor shall submit a list of those individuals and companies contacted prior to vibration-producing activities.

As a minimum, the following structures shall be contacted and surveyed prior to beginning potential vibration-producing activities:

| Owner               | Address                    |
|---------------------|----------------------------|
| Chamber of Commerce | 202 North 3rd Street       |
| Anthony Kobetsky    | 215 Northridge Hills Court |
| Henry Stinnett      | 219 Northridge Hills Court |
| City of Grand Forks | 223 Northridge Hills Court |

|                     |                            |
|---------------------|----------------------------|
| Gary Mitchell       | 227 Northridge Hills Court |
| City of Grand Forks | 251 Northridge Hills Court |
| City of Grand Forks | 122 Gentle Hills Circle    |
| City of Grand Forks | 114 Gentle Hills Circle    |
| Joanne Panther      | 126 Rolling Hills Circle   |
| Jay Potulny         | 122 Rolling Hills Circle   |
| Michael Conneran    | 48 Sloping Hills Cove      |
| Allen Merrill       | 51 Sloping Hills Cove      |
| Marian Hoekstra     | 55 Sloping Hills Cove      |
| Gary Zick           | 59 Sloping Hills Cove      |
| City of Grand Forks | 53 Sloping Hills Cove      |

### 3.12.2 Preconstruction Structure Surveys

Preconstruction surveys shall be performed by qualified specialists, as approved, and retained by the Contractor for observing the condition of existing structures in the vicinity of the work at required intervals. Each survey shall include all existing structures located within 100 feet of potential vibration-producing and settlement-producing activities including, but not limited to, pile driving, deep excavations, dewatering operations, and levee and fill construction. Each structure shall be completely surveyed. The preconstruction survey shall produce a report including diagrams as necessary of accessing all existing foundations, floors, walls, partitions, and roofs as determined by the Contracting Officer. The report shall show and describe existing interior and exterior cracks, including elevations and photographs and video tapes of cracks/damage, and such other data as applicable to locate and define the amount and extent of existing damage. All existing structure deficiencies, major or minor, shall be identified and recorded. Crack displacement monitoring gauges shall be installed as appropriate in structures within a radius of 100 feet of the contract work in order to help verify distress if any should develop. Crack displacement monitoring gauges shall be read by the Contractor on a weekly basis.

### 3.12.3 Preconstruction Condition Surveys

The Contractor shall photograph and video tape facilities within the work limits, including, but not limited to, roads, borrow areas, sidewalks, trees, shrubs, and lawns prior to working in an area in order to document the preconstruction conditions. The Contractor shall also take photographs and video tape the conditions in the same areas upon completion of the project.

### 3.12.4 Preconstruction Survey Reports

The Contractor shall prepare and submit to the Contracting Officer, prior to the start of contract construction work/activities at each work site, 2 bound copies of each preconstruction damage report containing surveys, photographs, and video tapes, sketches and diagrams, field notes taken, descriptions and reports, all signed and witnessed by the persons involved in the survey. Thereafter, as contract work progresses, the Contractor shall resurvey as often as necessary, as required by the Contracting Officer, in order to verify the adequacy of the Contractor's construction methods for prevention of damage and to obtain sufficient evidence for use in defense against possible claims for damage from third parties. Data obtained by the Contractor from each resurvey shall be submitted to the Contracting Officer within 5 calendar days after the Contractor has obtained it.

3.12.5 Contractor Responsibility

Nothing contained herein shall relieve the Contractor of responsibility for claims arising from its construction operations. Failure to inspect any structure, whether or not required by the contract documents, or inadequacy of the inspections shall not relieve the Contractor of its responsibilities.

-- End of Section --

# ATTACHMENT A

## PHASE 1 LEVEES UTILITY CONTACT SUMMARY

1/15/2001

| UTILITY COMPANY NAME                      | UTILITY AFFECTED                               | ADDRESS   | CONTACT PERSON                            | PHONE NUMBER                       |
|---|--|---|---|------------------------------------|
| Xcel Energy (formerly NSP) Gas            | Underground Gas                                | PO Box 13038<br>Grand Forks, ND 58208-3038                                | Doug Foy                                  | 701-795-5234                       |
| Xcel Energy (formerly NSP) Electric       | Overhead Power - Transmission Lines            | 2302 Great Northern Drive<br>Fargo, ND 58101                              | Brad Sylliaasen                           | 701-241-8626                       |
| NoDAK Power                               | Underground & Overhead Power - Service Lines   | PO Box 13000<br>Grand Forks, ND 58208                                     | John Rodgers                              | 701-746-4461                       |
| MnDAK Power                               | Overhead Power - Transmission Lines            | PO Box 13200<br>Grand Forks, ND 58208-3200                                | Ray Burnstad                              | 701-795-4000<br>701-795-4333 (fax) |
| UND - Telecommunications                  | UND Fiber Optic                                | PO Box 7141<br>Grand Forks, ND 58208                                      | Larry Fisk                                | 701-777-3708                       |
| US West - Communications                  | Fiber Optic, Toll Cable, Underground Telephone | PO Box 13160<br>Grand Forks, ND 58208-3160                                | Judy Gerszewski                           | 701-775-1281                       |
| Grand Forks County Road Authority         | County and Township Roads                      | PO Box 5682<br>Grand Forks, ND 58206                                      | Richard Onstad                            | 701-780-8248                       |
| Grand Forks County Water Resources        | Public Drainage Systems                        | Box 478<br>Larimore, ND 58251   | Ray Trosen                                | 701-343-2547                       |
| City of Grand Forks Engineering           | Sanitary Sewer Forcemain and Watermain         | PO Box 5200<br>Grand Forks, ND 58206                                      | Mark Walker                               | 701-746-2648<br>701-746-2514 (fax) |
| Brenna Township                           | Brenna Township Roads and Bridges              | Grand Forks, ND   | Keith Berg                                | 701-772-7789                       |
| Rye Township                              | Rye Township Roads and Bridges                 | 1751 21st Avenue NE<br>Grand Forks, ND 58203                              | Terrance J. Stromsodt                     | 701-746-7212                       |
| North Dakota Department of Transportation | State Highways                                 | Grand Forks District Office<br>PO Box 13077<br>Grand Forks, ND 58208-3077 | Nick Ludowese,<br>Asst. District Engineer | 701-787-6500                       |

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01090

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

1.2 ORDERING INFORMATION

-- End of Section Table of Contents --



SECTION 01090

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the sponsoring organization, e.g. ASTM B 564 Nickel Alloy Forgings. However, when the sponsoring organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the organizations whose publications are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the sponsoring organization should be ordered from the source by title rather than by number.

ACI INTERNATIONAL (ACI)

P.O. Box 9094  
Farmington Hills, MI 48333-9094  
Ph: 248-848-3700  
Fax: 248-848-3701  
Internet: <http://www.aci-int.org>  
AOK 6/00  
LOK 6/00

AGRICULTURAL MARKETING SERVICE (AMS)

Seed Regulatory and Testing Branch  
USDA, AMS, LS Div.  
Room 209, Bldg. 306, BARC-East  
Beltsville, MD 20705-2325  
Ph: 301-504-9430  
Fax: 301-504-8098  
Internet: <http://www.ams.usda.gov/lsg>  
e-mail: [james\\_p\\_triplett@usda.gov](mailto:james_p_triplett@usda.gov)  
AOK 6/00  
LOK 6/00

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

30 W. University Dr.  
Arlington Heights, IL 60004-1893  
Ph: 847-394-0150  
Fax: 847-253-0088

Grand Forks Phase 2 Levees

Internet: [www.amca.org](http://www.amca.org)  
AOK 6/00  
LOK 6/00

ALUMINUM ASSOCIATION (AA)

900 19th Street N.W.  
Washington, DC 20006  
Ph: 202-862-5100  
Fax: 202-862-5164  
Internet: [www.aluminum.org](http://www.aluminum.org)  
AOK 6/00  
LOK 6/00

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

1827 Walden Ofc. Sq.  
Suite 104  
Schaumburg, IL 60173-4268  
Ph: 847-303-5664  
Fax: 847-303-5774  
Internet: [www.aamanet.org](http://www.aamanet.org)  
AOK 6/00  
LOK 6/00

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

444 N. Capital St., NW, Suite 249  
Washington, DC 20001  
Ph: 800-231-3475 202-624-5800  
Fax: 800-525-5562 202-624-5806  
Internet: [www.aashto.org](http://www.aashto.org)  
AOK 6/00  
LOK 6/00

AMERICAN BEARING MANUFACTURERS ASSOCIATION (AFBMA)

1200 19th Street, NW, Suite 300  
Washington, DC 20036-2422  
Ph: 202-429-5155  
Fax: 202-828-6042  
Internet: [abma-dc.org](http://abma-dc.org)  
AOK 6/00  
LOK 6/00

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

1330 Kemper Meadow Dr.  
Suite 600  
Cincinnati, OH 45240  
Ph: 513-742-2020  
Fax: 513-742-3355  
Internet: [www.acgih.org](http://www.acgih.org)  
E-mail: [pubs@acgih.org](mailto:pubs@acgih.org)  
AOK 6/00  
LOK 6/00

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)

American Wood Council  
ATTN: Publications Dept.  
1111 Nineteenth St. NW, Suite 800  
Washington, DC 20036  
Ph: 800-294-2372 202-463-2700  
Fax: 202-463-2471  
Internet: <http://www.afandpa.org>  
AOK 6/00  
LOK 6/00

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)

1500 King St., Suite 201  
Alexandria, VA 22314-2730  
Ph: 703-684-0211  
Fax: 703-684-0242  
Internet: [www.agma.org](http://www.agma.org)  
AOK 6/00  
LOK 6/00

AMERICAN HARDBOARD ASSOCIATION (AHA)

1210 West Northwest Highway  
Palatine, Illinois 60067  
847-934-8800  
Fax: 847-934-8803  
[aha@hardboard.org](mailto:aha@hardboard.org)  
[www.ahardbd.org](http://www.ahardbd.org)

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

One East Wacker Dr., Suite 3100  
Chicago, IL 60601-2001  
Ph: 312-670-2400  
Publications: 800-644-2400  
Fax: 312-670-5403  
Internet: [www.aisc.org](http://www.aisc.org)  
AOK 6/00  
LOK 6/00

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

7012 So. Revere Parkway, Suite 140  
Englewood, CO 80112  
Ph: 303-792-9559  
Fax: 303-792-0669  
Internet: [www.aitc-glulam.org](http://www.aitc-glulam.org)  
AOK 6/00  
LOK 6/00

AMERICAN IRON AND STEEL INSTITUTE (AISI)

1101 17th St., NW Suite 1300  
Washington, DC 20036  
Ph: 202-452-7100  
AOK 6/00  
LOK 6/00

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

11 West 42nd St  
New York, NY 10036  
Ph: 212-642-4900  
Fax: 212-398-0023  
Internet: [www.ansi.org/](http://www.ansi.org/)  
Note: Documents beginning with the letter "S" can be ordered from:  
Acoustical Society of America  
P. O. Box 1020  
Sweickley, PA 15143-9998  
Ph: 412-741-1979  
Fax: 412-741-0609  
Internet: [asa.aip.org](http://asa.aip.org)  
AOK 6/00  
LOK 6/00

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)

1250 I St., NW, Suite 500  
Washington, DC 20005-3922  
Ph: 202-789-2900  
FAX: 202-789-1893  
AOK 6/00  
LOK 6/00

AMERICAN PETROLEUM INSTITUTE (API)

1220 L St., NW  
Washington, DC 20005-4070  
Ph: 202-682-8000  
Fax: 202-962-4776  
Internet: <http://www.api.org>  
AOK 6/00  
LOK 6/00

AMERICAN RAILWAY ENGINEERING & MAINTENANCE-OF-WAY ASSOCIATION  
(AREMA)

8201 Corporate Dr., Suite 1125  
Landover, MD 20785-2230  
Ph: 301-459-3200  
Fax: 301-459-8077  
Internet: [www.arema.org](http://www.arema.org)  
AOK 6/00  
LOK 6/00

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

100 Barr Harbor Drive  
West Conshohocken, PA 19428-2959  
Ph: 610-832-9585  
Fax: 610-832-9555  
Internet: [www.astm.org](http://www.astm.org)  
AOK 6/00  
LOK 6/00

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

1801 Alexander Bell Drive  
Reston, VA 20190-4400  
Ph: 703-295-6300 - 800-548-2723  
Fax: 703-295-6222  
Internet: [www.asce.org](http://www.asce.org)  
e-mail: [marketing@asce.org](mailto:marketing@asce.org)  
AOK 6/00  
LOK 6/00

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING  
ENGINEERS (ASHRAE)

1791 Tullie Cir., NE  
Atlanta, GA 30329  
Ph: 800-527-4723 or 404-636-8400  
Fax: 404-321-5478  
Internet: <http://www.ashrae.org>  
AOK 6/00  
LOK 6/00

AMERICAN SOCIETY OF SANITARY ENGINEERING FOR PLUMBING AND SANITARY  
RESEARCH (ASSE)

901 Canterbury, Suite A  
Westlake, OH 44145  
Ph: 440-835-3040  
Fax: 440-835-3488  
E-mail: [asse@ix.netcom.com](mailto:asse@ix.netcom.com)  
Internet: [www.asse-plumbing.org](http://www.asse-plumbing.org)  
AOK 6/00  
LOK 6/00

AMERICAN WATER WORKS ASSOCIATION(AWWA)

6666 West Quincy  
Denver, CO 80235  
Ph: 800-926-7337 - 303-794-7711  
Fax: 303-347-0804  
Internet: [www.awwa.org](http://www.awwa.org)  
AOK 6/00  
LOK 6/00

AMERICAN WELDING SOCIETY (AWS)

550 N.W. LeJeune Road  
Miami, FL 33126  
Ph: 800-443-9353 - 305-443-9353  
Fax: 305-443-7559  
Internet: <http://www.amweld.org>  
AOK 6/00  
LOK 6/00

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

P.O. Box 5690  
Grandbury, TX 76049-0690  
Ph: 817-326-6300  
Fax: 817-326-6306

Grand Forks Phase 2 Levees

Internet: <http://www.awpa.com>  
AOK 8/00  
LOK 6/00

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

P.O.Box 11700  
Tacoma, WA 98411-0700  
Ph: 253-565-6600  
Fax: 253-565-7265  
Internet: [www.apawood.org](http://www.apawood.org)  
AOK 8/00  
LOK 6/00

ASBESTOS CEMENT PIPE PRODUCERS ASSOCIATION (ACPPA)

1745 Jefferson Davis Highway, Suite 406  
Arlington, VA 22202  
Ph: 703-412-1153  
Fax: 703-412-1152

ASME INTERNATIONAL (ASME)

Three Park Avenue  
New York, NY 10016-5990  
Ph: 212-591-7722  
Fax: 212-591-7674  
Internet: [www.asme.org](http://www.asme.org)  
AOK 8/00  
LOK 6/00

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

355 Lexington Ave.  
17th floor  
New York, NY 10017-6603  
Ph: 212-297-2100  
Fax: 212-370-9047  
Internet: [www.buildershardware.com](http://www.buildershardware.com)  
AOK 8/00  
LOK 6/00

CALIFORNIA REDWOOD ASSOCIATION (CRA)

405 Enfrente Drive., Suite 200  
Novato, CA 94949  
Ph: 415-382-0662  
Fax: 415-382-8531  
Internet: [www.calredwood.org](http://www.calredwood.org)  
AOK 8/00  
LOK 6/00

CAST IRON SOIL PIPE INSTITUTE (CISPI)

5959 Shallowford Rd., Suite 419  
Chattanooga, TN 37421  
Ph: 423-892-0137  
Fax: 423-892-0817

Grand Forks Phase 2 Levees

Internet: [www.cispi.org](http://www.cispi.org)  
AOK 8/00  
LOK 6/00

CODE OF FEDERAL REGULATIONS (CFR)

Order from:  
Government Printing Office  
Washington, DC 20402  
Ph: 202-512-1800  
Fax: 202-275-7703  
Internet: <http://www.gpo.gov>  
AOK 8/00  
LOK 6/00

COMMERCIAL ITEM DESCRIPTIONS (CID)

Order from:  
General Services Administration  
Federal Supply Service Bureau  
470 E L'Enfant Plaza, S.W., Suite 8100  
Washington, DC 20407  
Ph: 202-619-8925  
Internet: <http://pub.fss.gsa.gov/h1-pub.html>  
LOK 6/00

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

933 N. Plum Grove Rd.  
Schaumburg, IL 60173-4758  
Ph: 847-517-1200  
Fax: 847-517-1206  
Internet: [www.crsi.org](http://www.crsi.org)  
AOK 8/00  
LOK 6/00

CORPS OF ENGINEERS (COE)

Order CRD-C documents from:  
U.S. Army Engineer Waterways Experiment Station  
ATTN: Technical Report Distribution Section, Services  
Branch, TIC  
3909 Halls Ferry Rd.  
Vicksburg, MS 39180-6199  
Ph: 601-634-2664  
Fax: 601-634-2388  
Internet: [www.libweb.wes.usace.army.mil/index.htm](http://www.libweb.wes.usace.army.mil/index.htm)  
AOK 10/00  
LOK 6/00

DEPARTMENT OF COMMERCE (DOC)

Order From:  
National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
Ph: 703-605-6000  
Fax: 703-605-6900  
Internet: <http://www.ntis.gov>

Grand Forks Phase 2 Levees

AOK 8/00  
LOK 6/00

DOOR AND HARDWARE INSTITUTE (DHI)

14150 Newbrook Dr.Suite 200  
Chantilly, VA 20151-2223  
Ph: 703-222-2010  
Fax: 703-222-2410  
Internet: [www.dhi.org](http://www.dhi.org)  
E-mail: [techdept@dhi.org](mailto:techdept@dhi.org)  
AOK 8/00  
LOK 6/00

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

245 Riverchase Parkway East, Suite 0  
Birmingham, AL 35244  
Ph: 205-402-8700  
Fax: 205-402-8730  
Internet: [www.dipra.org](http://www.dipra.org)  
E-mail: [info@dipra.org](mailto:info@dipra.org)  
AOK 8/00  
LOK 6/00

ENGINEERING MANUALS (EM)

USACE Publications Depot  
Attn: CEIM-SP-D  
2803 52nd Avenue  
Hyattsville, MD 20781-1102  
Ph: 301-394-0081  
Fax: 301-394-0084  
Internet: [www.usace.army.mil](http://www.usace.army.mil)  
AOK 8/00  
LOK 6/00

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Ariel Rios Building  
1200 Pennsylvania Avenue, N.W.  
Washington, DC 20460  
Ph: 202-260-2090  
FAX: 202-260-6257  
Internet: <http://www.epa.gov>  
NOTE: Some documents are available only from: National Technical  
Information Services (NTIS)  
5285 Port Royal Rd.  
Springfield, VA 22161  
Ph: 800-553-6847  
Fax: 703-321-8547  
Internet: [www.ntis.gov](http://www.ntis.gov)  
AOK 8/00  
LOK 6/00

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)



## Grand Forks Phase 2 Levees

500 River Ridge Drive  
Norwood, MA 02062  
Ph: 781-440-8000  
Ph: (Toll-Free): 877-364-6726  
Fax: 718-440-8742  
Internet: [www.fmglobal.com](http://www.fmglobal.com)  
AOK 8/00  
LOK 6/00

### FEDERAL HIGHWAY ADMINISTRATION (FHWA)

Office of Highway Safety (HHS-31)  
400 Seventh St., SW  
Washington, DC 20590-0001  
Ph: 202-366-0411  
Fax: 202-366-2249  
Internet: [www.fhwa.dot.gov](http://www.fhwa.dot.gov)  
Order from:  
Government Printing Office  
Superintendent of Documents  
Washington, DC 20402  
Ph: 202-783-3238  
AOK 8/00  
LOK 6/00

### FEDERAL SPECIFICATIONS (FS)

Order from:  
General Services Administration  
Federal Supply Service Bureau  
470 L'Enfant Plaza, S.W.  
Washington, DC 20407  
Ph: 202-619-8925  
Fax: 202-619-8978  
Internet: <http://pub.fss.gsa.gov/>

### GEOSYNTHETIC INSTITUTE (GSI)

475 Kedron Ave.  
Folsom, PA 19033-1208  
Ph: 610-522-8440  
Fax: 610-522-8441  
AOK 8/00  
LOK 6/00

### GLASS ASSOCIATION OF NORTH AMERICA (GANA)

2945 SW Wanamaker Drive, Suite A  
Topeka, KS 66614-5321  
Ph: 785-271-0208  
Fax: 785-271-0166  
Internet: [www.glasswebsite.com](http://www.glasswebsite.com)  
AOK 8/00  
LOK 6/00

### HYDRAULIC INSTITUTE (HI)

9 Sylvan Way, Suite 180  
Parsippany, NJ 07054-3802

Grand Forks Phase 2 Levees

Ph: 888-786-7744 or 973-267-9700  
Fax: 973-267-9055  
Internet: [www.pumps.org](http://www.pumps.org)  
AOK 8/00  
LOK 6/00

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

120 Wall St., 17th Floor  
New York, NY 10005-4001  
Ph: 212-248-5000  
Fax: 212-248-5017  
Internet: [www.iesna.org](http://www.iesna.org)  
AOK 8/00  
LOK 6/00

INSECT SCREENING WEAVERS ASSOCIATION (ISWA)

P.O. Box 1018  
Ossining, NY 10562  
Ph: 914-962-9052  
Fax: 914-923-3031  
AOK 8/00  
LOK 6/00

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

445 Hoes Ln, P. O. Box 1331  
Piscataway, NJ 08855-1331  
Ph: 732-981-0060 OR 800-701-4333  
Fax: 732-981-9667  
Internet: [www.ieee.org](http://www.ieee.org)  
E-mail: [customer.service@ieee.org](mailto:customer.service@ieee.org)  
AOK 8/00  
LOK 6/00

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS  
INDUSTRY (MSS)

127 Park St., NE  
Vienna, VA 22180-4602  
Ph: 703-281-6613  
Fax: 703-281-6671  
Internet: [www.mss-hq.com](http://www.mss-hq.com)  
e-mail: [info@mss-hq.com](mailto:info@mss-hq.com)  
AOK 8/00  
LOK 6/00

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

2017 So. 139th Cir.  
Omaha, NE 68144  
Ph: 402-342-3463  
Fax: 402-330-9702  
Internet: [www.micainsulation.org](http://www.micainsulation.org)  
e-mail: [info@micainsulation.org](mailto:info@micainsulation.org)  
AOK 8/00  
LOK 6/00

MILITARY SPECIFICATIONS (MS)

Order from:  
Standardization Documents Order Desk  
Building 4, Section D  
700 Robbins Ave.  
Philadelphia, PA 19111-5094  
Ph: 215-697-5147  
Fax: 215-697-5148  
Internet: [www.dodssp.daps.mil](http://www.dodssp.daps.mil)  
AOK 8/00  
LOK 6/00

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

8 S. Michigan Ave, Suite 1000  
Chicago, IL 60603  
Ph: 312-782-4951  
Fax: 312-332-0706  
Internet: [www.naamm.org](http://www.naamm.org)  
e-mail> [naamm@gss.net](mailto:naamm@gss.net)  
AOK 8/00  
LOK 6/00

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)

2302 Horse Pen Road  
Herndon, VA 2071-3499  
Ph: 703-713-1900  
Fax: 703-713-1910  
Internet: <http://www.ncma.org>

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1300 N. 17th St., Suite 1847  
Rosslyn, VA 22209  
Ph: 703-841-3200  
Fax: 703-841-3300  
Internet: <http://www.nema.org/>  
AOK 8/00  
LOK 6/00

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

1300 Spring Street Suite 500  
Silver Spring, Maryland 20910  
301-589-NRFC  
Fax: 301-588-6342  
[nfrcusa@aol.com](mailto:nfrcusa@aol.com)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1 Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9101  
Ph: 617-770-3000  
Fax: 617-770-0700  
Internet: [www.nfpa.org](http://www.nfpa.org)  
NOTE: The complete set of 1997 NFPA National Fire Codes (13 Vol.)  
is available for \$835.00.

Grand Forks Phase 2 Levees

AOK 8/00  
LOK 8/00

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

P.O. Box 34518  
Memphis, TN 38184-0518  
Ph: 901-377-1818  
Fax: 901-382-6419  
e-mail: nhla@natlhardwood.org  
Internet: natlhardwood.org  
AOK 8/00  
LOK 6/00

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

Department of Commerce  
Gaithersburg, MD 20899-0001  
Ph: 301-975-4025  
Fax: 301-926-1630  
Order Publications From:  
Superintendent of Documents  
U.S. Government Printing Office (GPO)  
Washington, DC 20402  
Ph: 202-512-1800  
Fax: 202-512-2250  
or  
National Technical Information Services (NTIS)  
5285 Port Royal Rd.  
Springfield, VA 22161  
Ph: 800-553-6847  
Fax: 703-321-8547  
Internet: www.gov/ntis.gov  
AOK 8/00  
LOK 6/00

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

900 Spring St.  
Silver Spring, MD 20910  
Ph: 301-587-1400  
Fax: 301-585-4219  
Internet: www.nrmca.org  
AOK 8/00  
LOK 6/00

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

10255 W. Higgins Rd., Suite 600  
Rosemont, IL 60018  
Ph: 847-299-9070  
Fax: 847-299-1183  
Internet: www.nrca.net  
AOK 8/00  
LOK 6/00

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

608 East Boulevard Avenue

Grand Forks Phase 2 Levees

Bismarck, ND 58505-0700  
fax: 701-328-4545  
Ph: 701-328-2500  
E-mail: dot@state.nd.us

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

272 Tuttle Road  
P.O. Box 87A  
Cumberland Center, ME 04021  
Ph: 207-829-6901  
Fax: 207-829-4293  
Internet: [www.nelma.org](http://www.nelma.org)  
e-mail: [nelma@javanet.com](mailto:nelma@javanet.com)  
AOK 8/00  
LOK 6/00

NSF INTERNATIONAL (NSF)

ATTN: Publications  
789 Dixboro Rd.  
P.O. Box 130140  
Ann Arbor, MI 48113-0140  
Ph: 734-769-8010  
Fax: 734-769-0109  
Toll Free: 800-NSF-MARK  
Internet: [www.nsf.org](http://www.nsf.org)  
AOK 8/00  
LOK 6/00

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

209 West Jackson Blvd.  
Chicago, IL 60606-6938  
Ph: 312-786-0300  
Fax: 312-786-0353  
Internet: [www.pci.org](http://www.pci.org)  
e-mail: [info@pci.org](mailto:info@pci.org)  
AOK 8/00  
LOK 6/00

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION  
(SMACNA)

4201 Lafayette Center Dr.,  
Chantilly, VA 20151-1209  
Ph: 703-803-2980  
Fax: 703-803-3732  
Internet: <http://www.smacna.org>  
e-mail: [info@smacna.org](mailto:info@smacna.org)  
AOK 8/00  
LOK 6/00

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

400 Commonwealth Dr.  
Warrendale, PA 15096-0001  
Ph: 724-776-4841  
Fax: 724-776-5760

Grand Forks Phase 2 Levees

Internet: <http://www.sae.org>  
e-mail: [publications@sae.org](mailto:publications@sae.org)  
AOK 8/00  
LOK 6/00

SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

400 Penn Center Boulevard, Suite 530  
Pittsburgh, PA 15235  
Ph: 412-829-0770  
Fax: 412-829-0844  
Internet: [www.cypressinfo.org](http://www.cypressinfo.org)  
AOK 8/00  
LOK 6/00

SOUTHERN PINE INSPECTION BUREAU (SPIB)

4709 Scenic Highway  
Pensacola, FL 32504-9094  
Ph: 850-434-2611  
Fax: 850-433-5594  
e-mail: [spib@spib.org](mailto:spib@spib.org)  
Internet: [www.spib.org](http://www.spib.org)  
AOK 8/00  
LOK 6/00

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

40 24th Street, 6th Floor  
Pittsburgh, PA 15222-4656  
Ph: 412-281-2331  
Fax: 412-281-9992  
Internet: [www.sspc.org](http://www.sspc.org)  
AOK 8/00  
LOK 6/00

NOTE: SSPC documents, except as noted otherwise, are available only as a part of the 1995 Steel Structures Painting Manual, 7th Edition @ \$115.00.

STEEL DECK INSTITUTE (SDI)

P.O. Box 25  
Fox River Grove, IL 60021-0025  
Ph: 847-462-1930  
Fax: 847-462-1940  
Internet: <http://www.sdi.org>  
e-mail: [Steve@sdi.org](mailto:Steve@sdi.org)  
AOK 8/00  
LOK 6/00

STEEL DOOR INSTITUTE (SDOI)

30200 Detroit Rd.  
Cleveland, OH 44145-1967  
Ph: 440-899-0010  
Fax: 440-892-1404  
Internet: [www.steeldoors.org](http://www.steeldoors.org)

Grand Forks Phase 2 Levees

AOK 8/00  
LOK 6/00

TRUSS PLATE INSTITUTE (TPI)

583 D'Onofrio Dr., Suite 200  
Madison, WI 53719  
Ph: 608-833-5900  
Fax: 608-833-4360  
AOK 8/00  
LOK 6/00

UNDERWRITERS LABORATORIES (UL)

333 Pfingsten Rd.  
Northbrook, IL 60062-2096  
Ph: 847-272-8800  
Fax: 847-272-8129  
Internet: <http://www.ul.com/>  
e-mail: [northbrook@us.ul.com](mailto:northbrook@us.ul.com)  
AOK 8/00  
LOK 6/00

US DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH  
ADMINISTRATION (OSHA)

US Department of Labor  
300 S. 4th Street Suite 1205  
Minneapolis, Minnesota 55415  
612-664-5460  
fax:664-5464

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

P.O. Box 23145  
Portland, OR 97281  
Ph: 503-639-0651  
Fax: 503-684-8928  
internet: [www.wclib.org](http://www.wclib.org)  
e-mail: [info@wclib.org](mailto:info@wclib.org)  
AOK 8/00  
LOK 6/00

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

Yeon Bldg.  
522 SW 5th Ave.  
Suite 500  
Portland, OR 97204-2122  
Ph: 503-224-3930  
Fax: 503-224-3934  
Internet: [www.wwpa.org](http://www.wwpa.org)  
e-mail: [info@wwpa.org](mailto:info@wwpa.org)  
AOK 8/00  
LOK 6/00

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 LUMP SUM PAYMENT ITEMS

1.1.1 Bonds

1.1.1.1 Payment

1.1.1.2 Unit of Measure

1.1.2 Preconstruction Damage Survey

1.1.2.1 Payment

1.1.2.2 Unit of Measure

1.1.3 Pump Station Site Work

1.1.3.1 Payment

1.1.3.2 Unit of Measure

1.1.4 Pump Station Structure

1.1.4.1 Payment

1.1.4.2 Unit of Measure

1.1.5 Pump Station Electrical

1.1.5.1 Payment

1.1.5.2 Unit of Measure

1.1.6 Pump Station Mechanical

1.1.6.1 Payment

1.1.6.2 Unit of Measure

1.1.7 Electrical Service

1.1.7.1 Payment

1.1.7.2 Unit of Measure

1.1.8 Sluice Gates

1.1.8.1 Payment

1.1.8.2 Unit of Measure

1.1.9 Interior Drainage

1.1.9.1 Payment

1.1.9.2 Unit of Measure

1.1.10 Gated Outlet Site Work

1.1.10.1 Payment

1.1.10.2 Unit of Measure

1.1.11 Gated Outlet Structure

1.1.11.1 Payment

1.1.11.2 Unit of Measure

1.1.12 Gated Outlet Mechanical

1.1.12.1 Payment

1.1.12.2 Unit of Measure

1.1.13 Detention Pond D3 Site Work

1.1.13.1 Payment

1.1.13.2 Unit of Measure

1.1.14 Detention Pond D3 Drainage Structure

1.1.14.1 Payment

1.1.14.2 Unit of Measure

1.1.15 Detention Pond D3 Riprap and Articulated Concrete Block System



Grand Forks Phase 2 Levees

- 1.1.15.1 Payment
- 1.1.15.2 Unit of Measure
- 1.1.16 Detention Pond D3 Seeding
  - 1.1.16.1 Payment
  - 1.1.16.2 Unit of Measure
- 1.1.17 Restroom Site Work
  - 1.1.17.1 Payment
  - 1.1.17.2 Unit of Measure
- 1.1.18 Restroom Structure
  - 1.1.18.1 Payment
  - 1.1.18.2 Unit of Measure
- 1.1.19 Restroom Electrical
  - 1.1.19.1 Payment
  - 1.1.19.2 Unit of Measure
- 1.1.20 Restroom Mechanical
  - 1.1.20.1 Payment
  - 1.1.20.2 Unit of Measure
- 1.1.21 Restroom Electrical Service
  - 1.1.21.1 Payment
  - 1.1.21.2 Unit of Measure
- 1.1.22 Restroom Sanitary Sewer
  - 1.1.22.1 Payment
  - 1.1.22.2 Unit of Measure
- 1.1.23 Restroom Water Service
  - 1.1.23.1 Payment
  - 1.1.23.2 Unit of Measure
- 1.1.24 Closure Structure
  - 1.1.24.1 Payment
  - 1.1.24.2 Unit of Measure
- 1.1.25 Demolition
  - 1.1.25.1 Payment
  - 1.1.25.2 Unit of Measurement
- 1.1.26 Clearing and Grubbing
  - 1.1.26.1 Payment
  - 1.1.26.2 Unit of Measurement
- 1.1.27 Stripping
  - 1.1.27.1 Payment
  - 1.1.27.2 Unit of Measurement
- 1.1.28 Floodwall
  - 1.1.28.1 Payment
  - 1.1.28.2 Unit of Measure
- 1.1.29 Concrete Planter Walls and Medallions
  - 1.1.29.1 Payment
  - 1.1.29.2 Unit of Measure
- 1.1.30 Segmental Block Retaining Walls
  - 1.1.30.1 Payment
  - 1.1.30.2 Unit of Measure
- 1.1.31 3rd Street Sanitary Sewer
  - 1.1.31.1 Payment
  - 1.1.31.2 Unit of Measure
- 1.1.32 3rd Street Interceptor
  - 1.1.32.1 Payment
  - 1.1.32.2 Unit of Measure
- 1.1.33 3rd Street Reconstruction
  - 1.1.33.1 Payment
  - 1.1.33.2 Unit of Measure
- 1.1.34 Parking Lot
  - 1.1.34.1 Payment
  - 1.1.34.2 Unit of Measure

Grand Forks Phase 2 Levees

- 1.1.35 Concrete Paving
  - 1.1.35.1 Payment
  - 1.1.35.2 Unit of Measure
- 1.1.36 Bituminous Paving
  - 1.1.36.1 Payment
  - 1.1.36.2 Unit of Measure
- 1.1.37 Concrete Stairs, Handrails, and Cheek Wall
  - 1.1.37.1 Payment
  - 1.1.37.2 Unit of Measure
- 1.1.38 Lighting/Electrical
  - 1.1.38.1 Payment
  - 1.1.38.2 Unit of Measure
- 1.1.39 Remove and Relocate Bollards and Signage
  - 1.1.39.1 Payment
  - 1.1.39.2 Unit of Measure
- 1.1.40 Regulatory Signage
  - 1.1.40.1 Payment
  - 1.1.40.2 Unit of Measure
- 1.1.41 Directional Signage
  - 1.1.41.1 Payment
  - 1.1.41.2 Unit of Measure
- 1.1.42 Crosswalk Striping
  - 1.1.42.1 Payment
  - 1.1.42.2 Unit of Measure
- 1.1.43 Trees, Shrubs, and Perennials
  - 1.1.43.1 Payment
  - 1.1.43.2 Unit of Measure
- 1.1.44 Topsoil and Class I Seeding (Turf Grasses)
  - 1.1.44.1 Payment
  - 1.1.44.2 Unit of Measure
- 1.1.45 Topsoil and Class II Seeding (Native Grasses)
  - 1.1.45.1 Payment
  - 1.1.45.2 Unit of Measure
- 1.1.46 Topsoil and Class II Seeding (with FORBS)
  - 1.1.46.1 Payment
  - 1.1.46.2 Unit of Measure
- 1.1.47 Topsoil and Class III Seeding (Moist Condition Grasses)
  - 1.1.47.1 Payment
  - 1.1.47.2 Unit of Measure
- 1.1.48 Split Rail Fence
  - 1.1.48.1 Payment
  - 1.1.48.2 Unit of Measure
- 1.1.49 Cylinder Pile Wall
  - 1.1.49.1 Payment
  - 1.1.49.2 Unit of Measure
- 1.1.50 Grading
  - 1.1.50.1 Payment
  - 1.1.50.2 Unit of Measure
- 1.1.51 Entry Sign
  - 1.1.51.1 Payment
  - 1.1.51.2 Unit of Measure
- 1.1.52 Chain Link Fence
  - 1.1.52.1 Payment
  - 1.1.52.2 Unit of Measure
- 1.2 UNIT PRICE PAYMENT ITEMS
  - 1.2.1 Signage on Closure Columns
    - 1.2.1.1 Payment
    - 1.2.1.2 Measurement
    - 1.2.1.3 Unit of Measure

## Grand Forks Phase 2 Levees

- 1.2.2 Levee Removal
  - 1.2.2.1 Payment
  - 1.2.2.2 Measurement
  - 1.2.2.3 Unit of Measure
- 1.2.3 Inspection Trench
  - 1.2.3.1 Payment
  - 1.2.3.2 Measurement
  - 1.2.3.3 Unit of Measure
- 1.2.4 Select Impervious Fill
  - 1.2.4.1 Payment
  - 1.2.4.2 Measurement
  - 1.2.4.3 Unit of Measure
- 1.2.5 Impervious Fill
  - 1.2.5.1 Payment
  - 1.2.5.2 Measurement
  - 1.2.5.3 Unit of Measure
- 1.2.6 Random Fill
  - 1.2.6.1 Payment
  - 1.2.6.2 Measurement
  - 1.2.6.3 Unit of Measure
- 1.2.7 Type A Trash Can
  - 1.2.7.1 Payment
  - 1.2.7.2 Measurement
  - 1.2.7.3 Unit of Measure
- 1.2.8 Type B Bollards
  - 1.2.8.1 Payment
  - 1.2.8.2 Measurement
  - 1.2.8.3 Unit of Measure
- 1.2.9 Type C Bollards
  - 1.2.9.1 Payment
  - 1.2.9.2 Measurement
  - 1.2.9.3 Unit of Measure
- 1.2.10 Transplanted Trees
  - 1.2.10.1 Payment
  - 1.2.10.2 Measurement
  - 1.2.10.3 Unit of Measure
- 1.2.11 Type B Bench
  - 1.2.11.1 Payment
  - 1.2.11.2 Measurement
  - 1.2.11.3 Unit of Measure
- 1.2.12 Type C Bench
  - 1.2.12.1 Payment
  - 1.2.12.2 Measurement
  - 1.2.12.3 Unit of Measure
- 1.2.13 Bank Stabilization, R20 Riprap
  - 1.2.13.1 Payment
  - 1.2.13.2 Measurement
  - 1.2.13.3 Unit of Measure
- 1.2.14 Trees, Shrubs, and Perennials
  - 1.2.14.1 Payment
  - 1.2.14.2 Measurement
  - 1.2.14.3 Unit of Measure
- 1.2.15 Slope Unloading
  - 1.2.15.1 Payment
  - 1.2.15.2 Measurement
  - 1.2.15.3 Unit of Measure

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section Table of Contents --

SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 LUMP SUM PAYMENT ITEMS

Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BIDDING SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.1.1 Bonds

1.1.1.1 Payment

Payment will be made for costs associated with securing all bonds by this Contract.

1.1.1.2 Unit of Measure

Unit of measure: lump sum.

1.1.2 Preconstruction Damage Survey

1.1.2.1 Payment

Payment will be made for costs associated with operations necessary for conducting preconstruction damage surveys. Work shall include, but not be limited to contracting property owners, photography, video photography, surveys, instrumentation, and preparation of reports.

1.1.2.2 Unit of Measure

Unit of measure: lump sum.

1.1.3 Pump Station Site Work

1.1.3.1 Payment

Payment will be made for costs associated with operations necessary for completion of site work associated with the pump stations. Work includes, but is not limited to excavation, grading, compaction of pavement subgrades, placement of pavement layers, construction of curbs and gutters and application of pavement markings. Work also includes construction of sidewalks associated with the pump stations and discharge structures. All incidentals shall be included.

## Grand Forks Phase 2 Levees

### 1.1.3.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.4 Pump Station Structure

#### 1.1.4.1 Payment

Payment will be made for costs associated with operations necessary for the construction of pump station and discharge chamber (Pump stations C1, D3, and E1) structures. Work includes, but is not limited to, excavation, temporary shoring, dewatering, traffic control, backfill, sheet pile, reinforced concrete foundations, walls, and slabs, masonry block walls, structural steel, roof systems including monorail support, doors, windows, fences and architectural interior and exterior treatments. Also included are miscellaneous metal appurtenances including but not limited to stairs, ladders, hatches, checkered plates, gratings and railings. Restoration of roads, curbs and sidewalks removed or damaged during construction is incidental to the price bid. All incidentals shall be included.

#### 1.1.4.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.5 Pump Station Electrical

#### 1.1.5.1 Payment

Payment will be made for costs associated with furnishing materials, equipment and labor and performing all operations necessary for the electrical features of the discharge structure and pump station.

Electrical features include, but are not limited to, raceways, conductors, enclosures, grounding, power distribution, lighting, receptacles, controls, instrumentation, telemetry, and switches. This shall also include the installation, mounting, connection, and testing of Government furnished equipment. All incidentals shall be included.

#### 1.1.5.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.6 Pump Station Mechanical

#### 1.1.6.1 Payment

Payment will be made for costs associated with furnishing materials, equipment and labor and performing all operations necessary for the mechanical features of the discharge structure and pump station.

Mechanical features include but are not limited to stop log guides, discharge piping, pump guide rails, wall sleeves and link seals, flap valves, trash rack, pipe supports, exhaust fans, ductwork, louvers, control dampers, actuators, unit heaters, thermostats, engine generator exhaust piping, exhaust pipe insulation, fuel tank vent piping, duct insulation, duct supports, monorail crane and installation and testing of Government-furnished equipment. All incidentals shall be included.

## Grand Forks Phase 2 Levees

The following equipment shall also be included in the lump sum price: One portable air blower, four 108 inch stop logs, one 48 inch stop log, and three trash rack rakes.

### 1.1.6.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.7 Electrical Service

#### 1.1.7.1 Payment

Payment will be made for costs associated with operations necessary for providing electrical service by the utility (Excel Energy) to the project. Work includes, but is not limited to contacting, scheduling, coordinating, providing access and reimbursing the utility (Excel Energy) for their cost associated with providing electrical service to the 3 pump stations and the Belmont Coulee Recreation Area.

#### 1.1.7.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.8 Sluice Gates

#### 1.1.8.1 Payment

Payment will be made for costs associated with furnishing materials, equipment, and labor and performing all operations necessary for the installation and operation of the sluice gates for the pump stations, gated outlets, and discharge chambers. This includes, but is not limited to, the sluice gates, seals, motorized gate operators, manual gate operators, and 2 portable electric gate operators.

#### 1.1.8.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.9 Interior Drainage

#### 1.1.9.1 Payment

Payment will be made for costs associated with operations necessary for the construction of interior drainage systems. Work includes, but is not limited to, installation of pipes, installation of geotextile fabric, manholes, precast and cast-in-place junction boxes and drop inlet structures, catch basins, grates, castings and outfall structures. The work shall also include required pavement removals, excavation, temporary shoring, dewatering, traffic control, connections to new and existing structures and backfilling of excavations. Restoration of roads, driveways, parking areas, sidewalks and turfed areas is incidental to the price bid. All incidentals shall be included.

#### 1.1.9.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.10 Gated Outlet Site Work

## Grand Forks Phase 2 Levees

### 1.1.10.1 Payment

Payment will be made for costs associated with operations necessary for completion of site work associated with the gated outlet. Work includes, but is not limited to excavation, grading, access road subgrade preparation and aggregate surface access road.

### 1.1.10.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.11 Gated Outlet Structure

#### 1.1.11.1 Payment

Payment will be made for costs associated with operations necessary for the construction of gated outlet (Gated Outlet F1) structure. Work includes, but is not limited to, excavation, temporary shoring, dewatering, traffic control, backfill, sheet pile, reinforced concrete foundations, walls, and slabs, and structural steel. Also included are miscellaneous metal appurtenances including but not limited to ladders, hatches, checkered plates, gratings and railings. Restoration of roads, curbs and sidewalks removed or damaged during construction is incidental to the price bid. All incidentals shall be included.

#### 1.1.11.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.12 Gated Outlet Mechanical

#### 1.1.12.1 Payment

Payment will be made for costs associated with furnishing materials, equipment and labor and performing all operations necessary for the mechanical features of the gated outlet.

Mechanical features include but are not limited to stop log guides. All incidentals shall be included.

The following equipment shall also be included in the lump sum price: One 48 inch stop log.

#### 1.1.12.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.13 Detention Pond D3 Site Work

#### 1.1.13.1 Payment

Payment will be made for costs associated with operations necessary for completion of site work associated with Detention Pond D3. Work includes clearing, grubbing, stripping, excavation, grading, berm construction, access road subgrade preparation, and aggregate surface access road for the discharge channel, stilling basin and pond.

#### 1.1.13.2 Unit of Measure



## Grand Forks Phase 2 Levees

Unit of measure: lump sum.

### 1.1.14 Detention Pond D3 Drainage Structure

#### 1.1.14.1 Payment

Payment will be made for costs associated with operations necessary for the construction of the drainage structure between the detention pond and stilling basin. Work includes, but is not limited to installation of the pond inlet structure and shall include excavation, backfilling of required excavations, and all incidentals for the construction of this structure.

#### 1.1.14.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.15 Detention Pond D3 Riprap and Articulated Concrete Block System

#### 1.1.15.1 Payment

Payment will be made for costs associated with operations necessary for installing riprap and articulated concrete blocks system in the stilling basin and discharge channels as shown on the drawings. This work includes subgrade preparation, installation of geotextile fabric, bedding stone, riprap, articulated concrete blocks, and other incidental operations.

#### 1.1.15.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.16 Detention Pond D3 Seeding

#### 1.1.16.1 Payment

Payment will be made for costs associated with operations necessary for completion of seeding work associated with Detention Pond D3. Work includes placing topsoil, furnishing, installing, mulching, watering and maintaining required seed and plants specified and as shown on the drawings.

#### 1.1.16.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.17 Restroom Site Work

#### 1.1.17.1 Payment

Payment will be made for costs associated with operations necessary for completion of site work associated with the restroom. Work includes, but is not limited to excavation, grading, and compaction of sidewalk subgrades. All incidentals shall be included.

#### 1.1.17.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.18 Restroom Structure

## Grand Forks Phase 2 Levees

### 1.1.18.1 Payment

Payment will be made for costs associated with operations necessary for the construction of the restroom structure. Work includes, but is not limited to excavation, backfill, reinforced concrete foundations and slabs, masonry block walls, structural steel, roof systems, doors, windows, skylights, architectural interior and exterior treatments, and all furnishings. All incidentals shall be included.

### 1.1.18.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.19 Restroom Electrical

#### 1.1.19.1 Payment

Payment will be made for costs associated with furnishing materials, equipment and labor and performing all operations necessary for the electrical features of the restroom structure.

Electrical features include but are not limited to raceways, conductors, enclosures, grounding, power distribution, lighting, receptacles, occupancy sensor, hand dryers and switches. All incidentals shall be included.

#### 1.1.19.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.20 Restroom Mechanical

#### 1.1.20.1 Payment

Payment will be made for costs associated with furnishing materials, equipment and labor and performing all operations necessary for the mechanical features of the restroom structure. Mechanical features include but are not limited to piping, plumbing fixtures, water meter, sleeves and seals, floor drains, valves, exterior drinking fountains, exhaust fans, exhaust grill, ductwork, duct insulation, duct supports, unit heaters, thermostats, water heaters, water storage tank, and miscellaneous toilet room accessories. All incidentals shall be included.

#### 1.1.20.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.21 Restroom Electrical Service

#### 1.1.21.1 Payment

Payment will be made for costs associated with operations necessary for providing electrical service by the utility (Excel Energy) to the project. Work includes, but is not limited to contacting, scheduling, coordinating, providing access and reimbursing the utility (Excel Energy) for their cost associated with providing electrical service to the Restroom in Belmont Coulee Recreation Area.

#### 1.1.21.2 Unit of Measure

## Grand Forks Phase 2 Levees

Unit of measure: lump sum.

### 1.1.22 Restroom Sanitary Sewer

#### 1.1.22.1 Payment

Payment will be made for costs associated with operations necessary for the construction of the sanitary sewer system. Work includes, but is not limited to, installation of PVC pipe, sanitary sewer manholes and gate valve and box. The work shall also include required pavement removals, excavation, connections to existing manhole and new structure and backfilling of excavations. Restoration of roads, driveways, parking areas, sidewalks and turfed areas is incidental to the price bid. All incidentals shall be included.

#### 1.1.22.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.23 Restroom Water Service

#### 1.1.23.1 Payment

Payment will be made for costs associated with operations necessary for the construction of the waterline system. Work includes, but is not limited to, installation of copper water line and service stop and box and water meter manhole. The work shall also include required pavement removals, excavation, connections to existing water main and new structure and backfilling of excavations. Restoration of roads, driveways, parking areas, sidewalks and turfed areas is incidental to the price bid. All incidentals shall be included.

#### 1.1.23.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.24 Closure Structure

#### 1.1.24.1 Payment

Payment will be made for costs associated with operations necessary for the construction of closure structures and transition walls. Work includes, but is not limited to, excavation, temporary shoring, dewatering, traffic control, backfill, grading, sheet pile cut-offs and transitions, reinforced concrete foundations, walls, approach slabs and columns, architectural surface treatments for walls, stop log sills, stop log guides and stop log supports. The work shall also include furnishing stop logs. Restoration of roads, curbs, sidewalks, and turfed areas is incidental to the price bid. All incidentals shall be included.

#### 1.1.24.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.25 Demolition

#### 1.1.25.1 Payment

Payment will be made for costs associated with operations for demolition,

removal and salvage of existing structures and equipment. Items to be demolished include, but is not limited to existing Belmont Road Pump Station, Lincoln Avenue Water Intake Control Building, abandoned storm and sanitary sewers, abandoned water mains, abandoned gas lines, manholes, roads, curbs, parking lots, sidewalks, foundations and slabs from removed homes or other structures, and utility services to removed homes. Debris shall be taken off site for proper disposal. Items to be salvaged include, but is not limited to pumps, valves, storm sewer gates, and equipment in existing Belmont Road Pump Station and Lincoln Avenue Water Intake Control Building, street lights, miscellaneous storm sewer trash guards, valves and gates, granitoid pavement on Lewis Boulevard, and miscellaneous recreation structures and drinking fountain in city parks. Salvaged items shall be delivered to the City.

1.1.25.2 Unit of Measurement

Unit of measure: lump sum.

1.1.26 Clearing and Grubbing

1.1.26.1 Payment

Payment will be made for costs associated with clearing and grubbing operations. Clearing and grubbing includes, but is not limited to preparation of areas scheduled for construction of pump stations, gated outlet, interior drainage structures, levees, recreation areas, closure structures and recreation trails. Material that can be salvaged shall be stored for later use. Debris shall be properly disposed. No allowances for clearing and grubbing outside the limits of construction unless authorized.

1.1.26.2 Unit of Measurement

Unit of measure: lump sum.

1.1.27 Stripping

1.1.27.1 Payment

Payment will be made for costs associated with stripping operations. Stripping includes, but is not limited to removal of vegetation and removal and stockpiling topsoil in areas scheduled for construction of pump stations, gated outlet, interior drainage structures, levees, recreation areas, closure structures and recreation trails. Material that can be salvaged shall be stored for later use. Debris shall be properly disposed. No allowances for clearing and grubbing outside the limits of construction unless authorized.

1.1.27.2 Unit of Measurement

Unit of measure: lump sum.

1.1.28 Floodwall

1.1.28.1 Payment

Payment will be made for costs associated with operations necessary for the construction of the floodwall. Work includes, but is not limited to, excavation, temporary shoring, dewatering, traffic control, backfill,

grading, sheet pile cut-offs and transitions, reinforced concrete foundations, walls, columns, joints, and architectural surface treatments for walls. Restoration of roads, curbs, sidewalks, and turfed areas is incidental to the price bid. All incidentals shall be included.

1.1.28.2 Unit of Measure

Unit of measure: lump sum.

1.1.29 Concrete Planter Walls and Medallions

1.1.29.1 Payment

Payment will be made for costs associated with operations necessary for construction and installation of cast-in-place concrete walls with formliner and bronze medallions, which includes performing required excavation, forming, staining, backfilling, compaction, fabrication, mounting and other incidental operations.

1.1.29.2 Unit of Measure

Unit of measure: lump sum.

1.1.30 Segmental Block Retaining Walls

1.1.30.1 Payment

Payment will be made for costs associated with operations necessary for construction of segmental block retaining wall, which includes performing required excavation, installing required reinforcement block, geotextile fabric, and associated fence. All incidentals shall be included.

1.1.30.2 Unit of Measure

Unit of measure: lump sum.

1.1.31 3rd Street Sanitary Sewer

1.1.31.1 Payment

Payment will be made for costs associated with operations necessary for the construction of the sanitary sewer system. Work includes, but is not limited to, installation of PVC pipe, sanitary sewer manholes and gate valve and box. The work shall also include required pavement removals, excavation, connections to existing manhole and new structure and backfilling of excavations. Restoration of roads, driveways, parking areas, sidewalks and turfed areas is incidental to the price bid. All incidentals shall be included.

1.1.31.2 Unit of Measure

Unit of measure: lump sum.

1.1.32 3rd Street Interceptor

1.1.32.1 Payment

Payment will be made for costs associated with operations necessary for the construction of the interceptor. Work includes, but is not limited to,

installation of RPC pipe, storm sewer manholes and catch basins. The work shall also include required pavement removals, excavation, connections to existing manhole and new structure and backfilling of excavations. Restoration of roads, driveways, parking areas, sidewalks and turfed areas is incidental to the price bid. All incidentals shall be included.

1.1.32.2 Unit of Measure

Unit of measure: lump sum.

1.1.33 3rd Street Reconstruction

1.1.33.1 Payment

Payment will be made for costs associated with operations necessary for the reconstruction of 3rd Street. Work includes, but is not limited to, excavation, compaction of subgrade, placement of pavement layers, construction of curbs and gutters, and application of pavement markings. All incidentals shall be included.

1.1.33.2 Unit of Measure

Unit of measure: lump sum.

1.1.34 Parking Lot

1.1.34.1 Payment

Payment will be made for costs associated with operations necessary for construction of cast-in-place concrete parking lot and access drive. Work includes, but is not limited to excavation, compaction of subgrade, placement of pavement layers, construction of curbs and gutters and application of pavement markings. All incidentals shall be included.

1.1.34.2 Unit of Measure

Unit of measure: lump sum.

1.1.35 Concrete Paving

1.1.35.1 Payment

Payment will be made for costs associated with operations necessary for construction of cast-in-place concrete walks, drives, parkings, curbs and gutters, and recreational feature pads which include performing required excavation, installing required reinforcement, concrete, and joints. All incidentals shall be included.

1.1.35.2 Unit of Measure

Unit of measure: lump sum.

1.1.36 Bituminous Paving

1.1.36.1 Payment

Payment will be made for costs associated with operations necessary for construction of bituminous trails, which includes performing required excavation, base course, and bituminous lifts. Work includes construction

of gravel shoulders for bituminous trails. All incidentals shall be included.

1.1.36.2 Unit of Measure

Unit of measure: lump sum.

1.1.37 Concrete Stairs, Handrails, and Cheek Wall

1.1.37.1 Payment

Payment will be made for costs associated with operations necessary for construction of cast-in-place concrete stairs, handrails, and cheek walls, which includes performing required excavation, installing required reinforcement, and concrete. All incidentals shall be included.

1.1.37.2 Unit of Measure

Unit of measure: lump sum.

1.1.38 Lighting/Electrical

1.1.38.1 Payment

Payment will be made for costs associated with furnishing materials, equipment and labor and performing all operations necessary for construction of exterior lighting and electrical systems. Work includes, but is not limited to excavation, trenching, backfilling, directional boring, conductors, enclosures, concrete foundations for lighting, power distribution, light poles and fixtures, floodlights and control centers. All incidentals shall be included.

1.1.38.2 Unit of Measure

Unit of measure: lump sum.

1.1.39 Remove and Relocate Bollards and Signage

1.1.39.1 Payment

Payment will be made for costs associated with operations necessary for removal and relocation of existing bollards and signage, which includes performing required excavation, removal, reinstallation, concrete footings, and required reinforcement. All incidental shall be included.

1.1.39.2 Unit of Measure

Unit of measure: lump sum.

1.1.40 Regulatory Signage

1.1.40.1 Payment

Payment will be made for costs associated with operations necessary for fabrication and installation of regulatory signage specified which includes performing required fabrication, mounting, and other incidental operations.

1.1.40.2 Unit of Measure

## Grand Forks Phase 2 Levees

Unit of measure: lump sum.

### 1.1.41 Directional Signage

#### 1.1.41.1 Payment

Payment will be made for costs associated with operations necessary for construction of directional signage, which includes performing required excavation, installation of wood post, signage, fabrication, painting, mounting and other incidental operations.

#### 1.1.41.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.42 Crosswalk Striping

#### 1.1.42.1 Payment

Payment will be made for costs associated with operations necessary for fabrication and installation of crosswalk striping which includes performing required cleaning, painting, and other incidental operations.

#### 1.1.42.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.43 Trees, Shrubs, and Perennials

#### 1.1.43.1 Payment

Payment for plant installation will be made for costs associated with furnishing, installing, mulching, watering, and maintaining the required plants and materials specified.

If the Government requires additional materials and work beyond that specified or shown in the Contract, the Contractor will receive compensation for the additional materials and work as Extra Work.

#### 1.1.43.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.44 Topsoil and Class I Seeding (Turf Grasses)

#### 1.1.44.1 Payment

Payment will be made for costs associated with operations necessary for installation of topsoil and seeding which includes performing required clearing, excavation, topsoil, seeding and other incidental operations.

#### 1.1.44.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.45 Topsoil and Class II Seeding (Native Grasses)

#### 1.1.45.1 Payment



## Grand Forks Phase 2 Levees

Payment will be made for costs associated with operations necessary for installation of topsoil and seeding which includes performing required clearing, excavation, topsoil, seeding and other incidental operations.

### 1.1.45.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.46 Topsoil and Class II Seeding (with FORBS)

#### 1.1.46.1 Payment

Payment will be made for costs associated with operations necessary for installation of topsoil and seeding which includes performing required clearing, excavation, topsoil, seeding and other incidental operations.

#### 1.1.46.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.47 Topsoil and Class III Seeding (Moist Condition Grasses)

#### 1.1.47.1 Payment

Payment will be made for costs associated with operations necessary for installation of topsoil and seeding which includes performing required clearing, excavation, topsoil, seeding and other incidental operations.

#### 1.1.47.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.48 Split Rail Fence

#### 1.1.48.1 Payment

Payment will be made for costs associated with operations necessary for construction and installation of split rail fence, which includes performing required excavation, backfilling, compaction, fabrication, mounting and other incidental operations.

#### 1.1.48.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.49 Cylinder Pile Wall

#### 1.1.49.1 Payment

Payment will be made for costs associated with operations necessary for the construction of the cylinder pile wall. Work includes, but is not limited to, excavation, temporary shoring, dewatering, traffic control, backfill, grading, reinforced concrete, placement of survey monument, restoration of turfed areas, and all incidentals for the construction of this structure.

#### 1.1.49.2 Unit of Measure

Unit of measure: lump sum.

## Grand Forks Phase 2 Levees

### 1.1.50 Grading

#### 1.1.50.1 Payment

Payment will be made for costs associated with operations necessary for grading, which includes performing required stripping, stockpiling, excavating, placing of fill, and other incidental operations.

#### 1.1.50.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.51 Entry Sign

#### 1.1.51.1 Payment

Payment will be made for costs associated with operations necessary for construction of entry signage, which includes performing required excavation, installation of posts, signage, fabrication, painting, mounting, and other incidental operations.

#### 1.1.51.2 Unit of Measure

Unit of measure: lump sum.

### 1.1.52 Chain Link Fence

#### 1.1.52.1 Payment

Payment will be made for costs associated with operations necessary for construction and installation of chain link fence which includes performing required excavation and concrete for posts, fabrication, mounting, and other incidental operations.

#### 1.1.52.2 Unit of Measure

Unit of measure: lump sum.

## 1.2 UNIT PRICE PAYMENT ITEMS

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the BIDDING SCHEDULE and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

### 1.2.1 Signage on Closure Columns

#### 1.2.1.1 Payment

Payment will be made for costs associated with operations necessary for construction and installation of signage and lettering, which includes performing required fabrication, mounting and other incidental operations.

#### 1.2.1.2 Measurement

## Grand Forks Phase 2 Levees

Signage will be measured by the number of units of each type-construct complete-in-place.

### 1.2.1.3 Unit of Measure

Unit of measure: each.

### 1.2.2 Levee Removal

#### 1.2.2.1 Payment

Payment will be made for costs associated with excavation of existing levees, which includes performing required excavation, stockpiling of topsoil and acceptable materials for levee construction, disposition of unacceptable materials, and grading, seeding, and restoration following completion of levee removal.

#### 1.2.2.2 Measurement

Levee removal shall be measured for payment by the cubic yard, in the original position, using the average-end-area method based on original and final ground lines as determined by the required surveys.

#### 1.2.2.3 Unit of Measure

Unit of measure: cubic yard.

### 1.2.3 Inspection Trench

#### 1.2.3.1 Payment

Payment will be made for costs associated with excavation, dewatering and backfilling inspection trenches with acceptable, compacted impervious material as specified and as shown on the drawings. Stockpiling of acceptable material for later use and disposition of unacceptable materials will be incidental to the price bid for inspection trenches.

#### 1.2.3.2 Measurement

Inspection trenches will be measured for payment by the linear foot. Inspection trenches excavated beyond the limits shown on the drawings and not authorized by the Contracting Officer will not be measured for payment.

#### 1.2.3.3 Unit of Measure

Unit of measure: linear foot.

### 1.2.4 Select Impervious Fill

#### 1.2.4.1 Payment

Payment will be made for the costs associated with the final placement and compaction of select impervious fill for the construction of the levees.

#### 1.2.4.2 Measurement

Select impervious fill shall be measured for payment by the cubic yard and quantities will be determined by the average-end-area method. The basis for payment will be cross sections of areas to be filled taken after

clearing, grubbing and stripping operations or the placement of underlying impervious fill material, where applicable, and the theoretical cross sections of the embankments constructed within the specified tolerance. Cross sections shall be performed at significant breaks in grade except that the maximum distance between cross sections shall not exceed 50 feet. Volumes occupied by floodwalls and discharge structures will not be included in measurement of select impervious fill for payment.

1.2.4.3 Unit of Measure

Unit of measure: cubic yard.

1.2.5 Impervious Fill

1.2.5.1 Payment

Payment will be made for the costs associated with the final placement and compaction of impervious fill for the construction of the levees.

1.2.5.2 Measurement

Impervious fill shall be measured for payment by the cubic yard and quantities will be determined by the average-end-area method. The basis for payment will be cross sections of areas to be filled taken after clearing, grubbing and stripping operations and the theoretical cross sections of the embankments constructed within the specified tolerance. Cross sections shall be performed at significant breaks in grade except that the maximum distance between cross sections shall not exceed 50 feet. Volumes occupied by floodwalls and discharge structures will not be included in measurement of impervious fill for payment.

1.2.5.3 Unit of Measure

Unit of measure: cubic yard.

1.2.6 Random Fill

1.2.6.1 Payment

Payment will be made for the costs associated with the final placement and compaction of random fill for the construction of the levees.

1.2.6.2 Measurement

Impervious fill shall be measured for payment by the cubic yard and quantities will be determined by the average-end-area method. The basis for payment will be cross sections of areas to be filled taken after clearing, grubbing and stripping operations and the theoretical cross sections of the embankments constructed within the specified tolerance. Cross sections shall be performed at significant breaks in grade except that the maximum distance between cross sections shall not exceed 50 feet. Volumes occupied by floodwalls and discharge structures will not be included in measurement of impervious fill for payment.

1.2.6.3 Unit of Measure

Unit of measure: cubic yard.

1.2.7 Type A Trash Can

1.2.7.1 Payment

Payment will be made for costs associated with operations necessary for fabrication and installation of trash receptacle specified which includes performing required fabrication, mounting, and other incidental operations.

1.2.7.2 Measurement

Trash receptacle will be measured by the number of units of each type-constructed complete-in-place.

1.2.7.3 Unit of Measure

Unit of measure: each.

1.2.8 Type B Bollards

1.2.8.1 Payment

Payment will be made for costs associated with operations necessary for fabrication and installation of bollards specified which includes performing required fabrication, mounting, and other incidental operations.

1.2.8.2 Measurement

Bollards will be measured by the number of units of each type-constructed complete-in-place.

1.2.8.3 Unit of Measure

Unit of measure: each.

1.2.9 Type C Bollards

1.2.9.1 Payment

Payment will be made for costs associated with operations necessary for fabrication and installation of Type C bollard specified which includes performing required fabrication, mounting, and other incidental operations.

1.2.9.2 Measurement

Type C Bollards will be measured by the number of units of each type-constructed complete-in-place.

1.2.9.3 Unit of Measure

Unit of measure: each.

1.2.10 Transplanted Trees

1.2.10.1 Payment

Payment for plant installation at a percentage of the contract price per unit of measure will be compensation in full for all costs relating to transplanting, mulching, watering, and maintaining, the required plants and materials specified.

If the Government requires additional materials and work beyond that specified or shown in the Contract, the Contractor will receive compensation for the additional materials and work as Extra Work.

1.2.10.2 Measurement

Trees of each size and type furnished by the Government and transplanted will be measured separately by the number of plants moved and maintained in an acceptable manner.

1.2.10.3 Unit of Measure

Unit of measure: each.

1.2.11 Type B Bench

1.2.11.1 Payment

Payment will be made for costs associated with operations necessary for fabrication and installation of bench specified which includes performing required fabrication, mounting, and other incidental operations.

1.2.11.2 Measurement

Benches will be measured by the number of units of each type-constructed complete-in-place.

1.2.11.3 Unit of Measure

Unit of measure: each.

1.2.12 Type C Bench

1.2.12.1 Payment

Payment will be made for costs associated with operations necessary for fabrication and installation of bench specified which includes performing required fabrication, mounting, and other incidental operations.

1.2.12.2 Measurement

Benches will be measured by the number of units of each type-constructed complete-in-place.

1.2.12.3 Unit of Measure

Unit of measure: each.

1.2.13 Bank Stabilization, R20 Riprap

1.2.13.1 Payment

Payment will be made for costs associated with operations necessary for installation of riprap stabilization which includes performing required clearing, excavation, furnishing, hauling and marine placement of riprap, and other incidental operations.

1.2.13.2 Measurement

## Grand Forks Phase 2 Levees

Riprap will be measured for payment by the ton. Quantities will be computed to the nearest whole ton. Weight tickets shall include time, date, truck number, and weight. Weight certificates furnished by a public weighmaster will be acceptable.

### 1.2.13.3 Unit of Measure

Unit of measure: Ton.

### 1.2.14 Trees, Shrubs, and Perennials

#### 1.2.14.1 Payment

Payment for plant installation will be compensation in full for all costs relating to furnishing, installing, mulching, watering, and maintaining, or transplanting and maintaining, the required plants and materials specified.

#### 1.2.14.2 Measurement

a. Plants Transplanted: Trees of each size and type furnished by the Government and transplanted will be measured separately by the number of plants moved and maintained in an acceptable manner.

b. Plants Furnished and Planted: Trees, shrubs, vines and perennials of each species, variety, size, or age, and root category furnished, planted, and maintained by the Contractor will be measured separately by the number of acceptable plants.

#### 1.2.14.3 Unit of Measure

Unit of measure: each.

### 1.2.15 Slope Unloading

#### 1.2.15.1 Payment

Payment will be made for costs associated with operations necessary for grading, which includes performing required stripping, stockpiling, excavation, and other incidental operations.

#### 1.2.15.2 Measurement

Slope unloading shall be measured by the cubic yard, in the original position, using the average-end-area method based on original and final ground lines as determined by the required lines as determined by the required surveys. Maximum distance between cross sections shall not exceed 50 feet.

#### 1.2.15.3 Unit of Measure

Unit of measure: cubic yard.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01320

PROJECT SCHEDULE

PART 1 GENERAL

- 1.1 SUBMITTALS
- 1.2 QUALIFICATIONS

PART 2 PRODUCTS

- 2.1 COMPUTER SOFTWARE REQUIREMENTS

PART 3 EXECUTION

- 3.1 GENERAL
- 3.2 BASIS FOR PAYMENT
- 3.3 SOFTWARE
  - 3.3.1 Use of the Critical Path Method
  - 3.3.2 Level of Detail Required
    - 3.3.2.1 Activity Durations
    - 3.3.2.2 Procurement Activities
    - 3.3.2.3 Government Activities
    - 3.3.2.4 Responsibility
    - 3.3.2.5 Feature of Work
  - 3.3.3 Scheduled Project Completion
    - 3.3.3.1 Constraint of Last Activity
    - 3.3.3.2 Early Project Completion
  - 3.3.4 Interim Completion Dates
  - 3.3.5 Default Progress Data Disallowed
  - 3.3.6 Out-of-Sequence Progress
  - 3.3.7 Extended Non-Work Periods
  - 3.3.8 Negative Lags
- 3.4 PROJECT SCHEDULE SUBMISSIONS
  - 3.4.1 Initial Project Schedule Submission
  - 3.4.2 Periodic Updates
  - 3.4.3 Standard Activity Coding Dictionary
- 3.5 SUBMISSION REQUIREMENTS
  - 3.5.1 Earnings Report
  - 3.5.2 Network Diagram
- 3.6 PERIODIC PROGRESS MEETINGS
  - 3.6.1 Meeting Attendance
  - 3.6.2 Update Submission Following Progress Meeting
  - 3.6.3 Progress Meeting Contents
- 3.7 REQUESTS FOR TIME EXTENSIONS
  - 3.7.1 Justification of Delay
  - 3.7.2 Submission Requirements
- 3.8 DIRECTED CHANGES
- 3.9 OWNERSHIP OF FLOAT



-- End of Section Table of Contents --

SECTION 01320

PROJECT SCHEDULE

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Schedules

Initial Project Schedule; GA. Periodic Updates; GA.

Five copies of the initial project schedule shall be submitted. Two copies of periodic project schedule updates shall be submitted.

SD-14 Samples

Software; FIO.

The Contractor shall furnish the Government copies of the scheduling software if required under paragraph COMPUTER SOFTWARE REQUIREMENTS.

1.2 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE REQUIREMENTS

The Contractor shall furnish the Government with the software to be used, unless waived by the Contracting Officer. The Contractor shall assist in installing the software in the Government resident office. The Contractor shall provide the software complete, including documentation and updates used in the Contractor's system. The software shall remain the property of the Contractor, but shall be in the possession of and for the exclusive use by the Government during the contract period. The Government shall have rights to install the software on 3 computers (resident office, area office, and district office).

PART 3 EXECUTION

3.1 GENERAL

Pursuant to the Contract Clause, SCHEDULES FOR CONSTRUCTION CONTRACTS, a project schedule as described below shall be prepared. The scheduling of work shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project shall contribute in developing and

maintaining an accurate project schedule. The approved project schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of progress payments.

### 3.2 BASIS FOR PAYMENT

The project schedule shall be the basis for measuring Contractor progress. The Contracting Officer will use an approved project schedule to evaluate Contractor progress for payment purposes. In the case where project schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the project schedule, then the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until the project schedule updates have been accepted.

### 3.3 SOFTWARE

Computer software systems utilized by the Contractor to produce the project schedule shall be capable of providing all requirements of this specification.

#### 3.3.1 Use of the Critical Path Method

The project schedule shall clearly show the critical path. If a network analysis system is used, the Critical Path Method (CPM) of network calculation shall be used to generate the project schedule, provided in either the Precedence Diagram Method (PDM) or the Arrow Diagram Method (ADM).

#### 3.3.2 Level of Detail Required

The project schedule shall include an appropriate level of detail. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the project schedule.

##### 3.3.2.1 Activity Durations

The Contractor shall breakout lump-sum or sum-job contract line items into subcategories, or activities. The number of activities shall be sufficient to allow the progress to be accurately determined between payment periods.

##### 3.3.2.2 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over calendar 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, delivery, installation, start-up, and testing.

##### 3.3.2.3 Government Activities

Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to: approvals, inspections, utility tie-in, Government furnished property, and notice to proceed for phasing requirements.

##### 3.3.2.4 Responsibility

All activities shall be identified in the project schedule by the party (Prime Contractor, subcontractor, Government agency, etc.) responsible to perform the work. Activities shall not belong to more than one responsible party. The responsible party for each activity shall be identified by the Responsibility Code.

#### 3.3.2.5 Feature of Work

All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to a work breakdown structure for the project schedule. The feature of work for each activity shall be identified by the Feature of Work Code.

#### 3.3.3 Scheduled Project Completion

The schedule interval shall extend from notice to proceed to the contract completion date. The notice to proceed date shall be taken as the date that notice to proceed was acknowledged.

##### 3.3.3.1 Constraint of Last Activity

Completion of the last activity in the project schedule shall be constrained by the contract completion date. If the early finish of the last activity falls after the contract completion date, then the critical path shall show a negative float.

##### 3.3.3.2 Early Project Completion

If the project schedule shows project completion prior to the contract completion date, the Contractor shall identify activities that have been accelerated and activities that are scheduled in parallel to support the "early" completion. The Contractor shall assist the Contracting Officer in evaluating the Contractor's ability to actually complete prior to the contract period.

#### 3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

#### 3.3.5 Default Progress Data Disallowed

The Contractor shall document the actual start and actual finish dates on the daily quality control report for every in-progress or completed activity and ensure that the data contained on the daily quality control reports is the sole basis for project schedule updating. Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual start and finish dates on the CPM schedule shall match those dates provided from Contractor quality control reports.

#### 3.3.6 Out-of-Sequence Progress

The Contracting Officer shall be notified prior to work on any activities that are out-of-sequence with the project schedule. The Contractor shall update the project schedule to correct any out-of-sequence work.

### 3.3.7 Extended Non-Work Periods

Non-work periods of over 5 working days shall be identified by addition of activities that represent the delays.

### 3.3.8 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

## 3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below.

### 3.4.1 Initial Project Schedule Submission

The project schedule shall provide a reasonable sequence of activities which represent work through the entire contract period and shall be at a reasonable level of detail.

### 3.4.2 Periodic Updates

Based on the result of progress meetings, the Contractor shall submit periodic project schedule updates. The Contractor shall furnish information and project schedule data, which in the judgement of the Contracting Officer, is necessary for verifying the Contractor's progress.

### 3.4.3 Standard Activity Coding Dictionary

The Contractor shall submit, with the initial project schedule, a coding scheme that shall be used throughout the project schedule for all activity codes contained in the project schedule. The coding scheme submitted shall list the values for each activity code category and translate those values into project specific designations. For example, a responsibility code value, "ELE", may be identified as "Electrical Subcontractor". Activity code values shall represent the same information throughout the duration of the contract.

## 3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted for each project schedule submission:

### 3.5.1 Earnings Report

The Contractor shall submit a compilation of the Contractor's Total Earnings on the project through the most recent Monthly Progress Meeting. Activities shall be grouped by contract line item. The printed report shall contain, for each contract line item: activity number, activity description, original budgeted amount, total quantity, quantity to date, percent complete (based on cost), and earnings to date. A total project percent complete shall also be provided. If necessary to substantiate partial payment and requested by the Contracting Officer, the earnings report shall detail activities within a contract line item.

### 3.5.2 Network Diagram

A network diagram shall be required on the initial project schedule submission and on periodic submissions when requested by the Contracting

Officer (not less than quarterly). The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The network diagram shall be constructed to meet the following conditions:

- a. Continuous Flow. Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity or event number, description, duration, and estimated earned value shall be shown on the diagram.
- b. Project Milestone Dates. Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.
- c. Critical Path. The critical path shall be clearly shown.
- d. Banding. Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.
- e. S-Curves. Earnings curves showing projected early and late earnings and earnings to date.

### 3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly onsite meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project.

#### 3.6.1 Meeting Attendance

The Contractor's project manager and the Contractor's authorized representative responsible for preparation of the project schedule shall attend the regular progress meeting.

#### 3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after every third monthly progress meeting.

#### 3.6.3 Progress Meeting Contents

Update information, including actual start dates, actual finish dates, remaining durations, and cost-to-date shall be subject to the approval of the Contracting Officer. The Contractor shall address the following minimum set of items, on an activity by activity basis, during each progress meeting.

- a. Start and Finish Dates. The actual start and actual finish dates for each completed activity. The actual start and projected finish dates for each activity in-progress.
- b. Cost Completion. The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work that

contains defects.

c. Project Schedule Changes. All changes pertaining to notice to proceed on change orders, change orders to be incorporated into the project schedule, Contractor proposed changes in work sequence, corrections to project schedule for out-of-sequence progress, lag durations, and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

d. Other Changes. Other changes required due to delays in completion of any activity or group of activities include unusually severe weather, product procurement, or other delays or work stoppages which make re-planning the work necessary.

### 3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, the Contractor shall furnish such justification, project schedule data and supporting evidence as the Contracting Officer may deem necessary for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract.

#### 3.7.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon an approved project schedule and other factual information. Delays that are caused by the Contractor's own actions will not be a cause for a time extension to the contract completion date.

#### 3.7.2 Submission Requirements

The Contractor shall submit a justification in accordance with the requirements of other appropriate contract clauses and shall include, as a minimum:

- a. A list of affected activities, with their associated project schedule activity number.
- b. A brief explanation of the cause(s) of the change.
- c. An analysis of the overall impact of the changes proposed.
- d. If requested by the Contracting Officer, the Contractor shall provide an interim project schedule update with revised activities.

### 3.8 DIRECTED CHANGES

If notice to proceed is issued for undefinitized work, the Contractor shall submit proposed project schedule revisions to the Contracting Officer within 14 calendar days of the notice to proceed being issued. The proposed revisions to the project schedule must be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor suggested revisions to the project schedule; and the Contractor shall update the project schedule with the Contracting Officer's revisions until a mutual agreement in the

revisions is reached.

### 3.9 OWNERSHIP OF FLOAT

Float available in the project schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

- 1.1 SUBMITTAL IDENTIFICATION
- 1.2 SUBMITTAL CLASSIFICATION
  - 1.2.1 Government Approved
  - 1.2.2 Information Only
- 1.3 APPROVED SUBMITTALS
- 1.4 DISAPPROVED SUBMITTALS
- 1.5 WITHHOLDING OF PAYMENT
- 1.6 MEASUREMENT AND PAYMENT

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

- 3.1 GENERAL
- 3.2 SUBMITTAL REGISTER (ENG FORM 4288)
- 3.3 SCHEDULING
- 3.4 TRANSMITTAL FORM (ENG FORM 4025)
- 3.5 SUBMITTAL PROCEDURE
  - 3.5.1 Submittal Copies
  - 3.5.2 Schedule
  - 3.5.3 Shop Drawings
  - 3.5.4 Deviations
- 3.6 CONTROL OF SUBMITTALS
- 3.7 GOVERNMENT APPROVED SUBMITTALS
- 3.8 INFORMATION ONLY SUBMITTALS
- 3.9 STAMPS
- 3.10 CONTRACTOR RECORD DRAWINGS
  - 3.10.1 Operation and Maintenance (O&M) Manuals
  - 3.10.2 As-Built Shop Drawings

-- End of Section Table of Contents --

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers as follows:

SD-01 Data

SD-04 Drawings

SD-06 Instructions

SD-07 Schedules

SD-08 Statements

SD-09 Reports

SD-13 Certificates

SD-14 Samples

SD-18 Records

SD-19 Operation and Maintenance Manuals

1.2 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.2.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of Section 00700 CONTRACT CLAUSE entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.2.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.3 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the CQC requirements of this contract is responsible for dimensions, the design of adequate connections

and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

#### 1.4 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with Section 00700 CONTRACT CLAUSE "Changes" shall be given promptly to the Contracting Officer.

#### 1.5 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

#### 1.6 MEASUREMENT AND PAYMENT

The work of this section will not be measured for payment. The Contractor shall be responsible for the work of this section, without any direct compensation being made other than the payment received for contract items.

### PART 2 PRODUCTS (Not Applicable)

### PART 3 EXECUTION

#### 3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

#### 3.2 SUBMITTAL REGISTER (ENG FORM 4288)

At the end of this section is one set of ENG Form 4288 listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contractor will also be given the

submittal register as a diskette containing the computerized ENG Form 4288 and instructions on the use of the diskette. Columns "d" through "r" have been completed by the Government; the Contractor shall complete columns "a", "b", "c", and "s" through "u" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within 7 calendar days after Notice to Proceed. The Contractor shall keep the submittal register up-to-date and shall submit it to the Government together with the monthly payment request. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

### 3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 30 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals. The submittal register shall provide for a reasonable timely distribution of shop drawings as they are prepared (particularly within a specific discipline, i.e.: structural, mechanical).

### 3.4 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

### 3.5 SUBMITTAL PROCEDURE

#### 3.5.1 Submittal Copies

The Contractor shall submit 6 hard copies or 1 hard copy and an electronic copy of each submittal (both Government approved and for information only) unless otherwise indicated. Each transmittal shall address only one submittal item. Transmittals returned for resubmission shall be resubmitted in their entirety. When approved by the Contracting Officer, routine test reports and delivery tickets may be submitted with daily quality control reports in place of following submittal procedures under this section.

#### 3.5.2 Schedule

Shop drawings shall be submitted with ample time (a minimum of 30 calendar days exclusive of mailing time) to secure Government approval prior to the time the items covered thereby are to be delivered to the site. Additional time should be allowed for possible resubmittal. Materials fabricated or delivered without Government approval of the shop drawing will be subject to rejection. All submittals shall be made prior to commencement of applicable work, and allow adequate time for government review acceptable to the Contracting Officer.

### 3.5.3 Shop Drawings

Shop drawings shall be reproductions on high quality paper with clear legible print. Drawings shall generally be bordered a minimum of one inch and trimmed to neat lines. Shop drawing quality will be subject to approval. Each shop drawing, including catalog data, shall be identified with a title block including the name of the Contractor, contract number, name and location of project, and name of the item of work or structure to which the shop drawing applies. Catalog data, including specifications and full descriptive matter, may be submitted as shop drawings. Catalog data must be supplemented as necessary to include all pertinent data to verify conformance to the contract documents. When catalog data includes non applicable data, the applicable data shall be clearly indicated.

### 3.5.4 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

### 3.6 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

### 3.7 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Five copies of the submittal will be retained by the Contracting Officer and 1 copy of the submittal will be returned to the Contractor.

### 3.8 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

### 3.9 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

|   |
|---|
| CONTRACTOR  |
| (Firm Name)   |
| <br>  |
| _____ Approved  |
| <br>  |
| _____ Approved with corrections as noted on submittal data and/or attached sheets(s). |
| <br>  |
| SIGNATURE: _____  |
| TITLE: _____  |
| DATE: _____   |

### 3.10 CONTRACTOR RECORD DRAWINGS

The Contractor shall maintain a separate set of marked-up full-scale contract drawings indicating as-built conditions. These drawings shall be maintained in a current condition at all times until completion of the work and shall be available for review by Government personnel at all times. All variations from the contract drawings, for whatever reason, including those occasioned by modifications, optional materials, and the required coordination between trades, shall be indicated. These variations shall be shown in the same general detail utilized in the contract drawings. Revisions shall be shown on all drawings and details related to the changed feature. These drawings shall be neatly prepared with clear legible print. Deleted items shall be indicated in red and added items or changed locations shall be shown in green. These drawings shall be furnished to the Contracting Officer within 30 days after the required contract completion date.

#### 3.10.1 Operation and Maintenance (O&M) Manuals

The Contractor shall prepare independent, comprehensive O&M Manuals for each pump station. The manuals shall include operation and maintenance instructions on both Contractor furnished the Government furnished property. O&M Manuals shall be delivered to the Contracting Officer within 30 days after the required contract completion date.

#### 3.10.2 As-Built Shop Drawings

The Contractor shall record changes to shop drawings to indicate as-built conditions. These drawings shall show all changes and revisions made up to the time the equipment is completed and accepted.

Grand Forks Phase 2 Levees

-- End of Section --

**TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE**

*(Read instructions on the reverse side prior to initiating this form)*

## SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS

(This section will be initiated by the contractor)

|   |                            |              |  |
|---|----------------------------|--------------|--|
| TO:   | FROM:                      | CONTRACT NO. | CHECK ONE:<br><input type="checkbox"/> THIS IS A NEW TRANSMITTAL<br><input type="checkbox"/> THIS IS A RESUBMITTAL OF<br>TRANSMITTAL _____ |
| SPECIFICATION SEC. NO. (Cover only one section with each transmittal) | PROJECT TITLE AND LOCATION |              | CHECK ONE: THIS TRANSMITTAL IS<br>FOR <input type="checkbox"/> FIO <input type="checkbox"/> GOV'T. APPROVAL                                |

[illegible]

REMARKS

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as other wise stated.

NAME AND SIGNATURE OF CONTRACTOR

## SECTION II - APPROVAL ACTION

| ENCLOSURES RETURNED <i>(List by Item No.)</i> | NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY | DATE |
|---|--|------|
|---|--|------|



INSTRUCTIONS

- 1. Section I will be initiated by the Contractor in the required number of copies.
- 2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
- 3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.
- 4. Submittals requiring expeditious handling will be submitted on a separate form.
- 5. Separate transmittal form will be used for submittals under separate sections of the specifications.
- 6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".
- 7. Form is self-transmittal, letter of transmittal is not required.
- 8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
- 9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

- |      |  |       |   |
|------|--|-------|---|
| A -- | Approved as submitted.   | E --  | Disapproved (See attached).   |
| B -- | Approved, except as noted on drawings.   | F --  | Receipt acknowledged.   |
| C -- | Approved, except as noted on drawings.<br>Refer to attached sheet resubmission required. | FX -- | Receipt acknowledged, does not comply<br>as noted with contract requirements. |
| D -- | Will be returned by separate correspondence.   | G --  | Other (Specify)   |
- 10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

**CONTRACT NO.**

(ER 415 1-10)

12

12  
SPECIFICATION SECTION

### TITLE AND LOCATION

**CONTRACTOR**

## SPECIFICATION

# Grand Forks Phase II Levees

01000

[illegible]



CONTRACT NO. 12

(ER 415 1-10)

[illegible]

CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

**01451**

[illegible]

CONTRACT NO. 12

(ER 415 1-10)

[illegible]

**SUBMITTAL REGISTER**  
(ER 415 1-10)

**CONTRACT NO.**

(ER 415 1-10)

12

### TITLE AND LOCATION

**CONTRACTOR**

# Grand Forks Phase II Levees

**01568**

[illegible]

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**



CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

**02220**

[illegible]

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

CONTRACT NO. 12

**CONTRACTOR**

02315

TRAN:  
MITTA  
NO.

IV-1 SPECIFICATION  
PARAGRAPH  
NUMBER

DESCRIPTION OF  
ITEM SUBMITTED

| a. | b. | c. | d.   |
|----|----|----|------|
|    |    |    | 3.14 |

## Testing

6

**X**

1

1

1000

1000

1000

|  |  |
|--|--|
|  |  |
|--|--|

|  |
|--|
|  |
|--|

**aa.**



CONTRACT NO. 12

**PAGE 1 OF 1 PAGES**

**CONTRACT NO.**

(ER 415 1-10)

12

**CONTRACTOR**

# Grand Forks Phase II Levees

**02388**

[illegible]







CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

02510

[illegible]



**CONTRACT NO.**

(ER 415 1-10)

ENG FORM 4288, Jul 96

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

**02754**

[illegible]

CONTRACT NO. 12

(ER 415 1-10)

ENG FORM 4288, Jul 96  
 SPECSINTACT  
 PAGE 1 OF 1 PAGES

**CONTRACT NO.**  
**12**

(ER 415 1-10)

[illegible]

SUBMITTAL REGISTER  
(ER 415 1-10)

CONTRACT NO.  
12

| TITLE AND LOCATION                   |                      | CONTRACTOR                           |                                  | SPECIFICATION SECTION |   |                     |                           |   |                   |                   |         |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------------------------|----------------------|--------------------------------------|----------------------------------|-----------------------|---|---------------------|---------------------------|---|-------------------|-------------------|---------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Grand Forks Phase II Levees          |                      |                                      |                                  | 02770                 |   |                     |                           |   |                   |                   |         |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| A<br>C<br>T<br>I<br>V<br>I<br>T<br>Y | TRAN:<br>MITT<br>NO. | SPECIFICATION<br>PARAGRAPH<br>NUMBER | DESCRIPTION OF<br>ITEM SUBMITTED | TYPE OF SUBMITTAL     |   | CLASSI-<br>FICATION | CONTRACTOR SCHEDULE DATES |   | CONTRACTOR ACTION | GOVERNMENT ACTION | REMARKS |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|                                      |                      |                                      |                                  | 1                     | 2 |                     | 3                         | 4 |                   |                   |         | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 | 1016 | 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 | 1024 | 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 | 1032 | 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 1040 | 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 | 1048 | 1049 | 1050 | 1051 | 1052 | 1053 | 1054 | 1055 | 1056 | 1057 | 1058 | 1059 | 1060 | 1061 | 1062 | 1063 | 1064 | 1065 | 1066 | 1067 | 1068 | 1069 | 1070 | 1071 | 1072 | 1073 | 1074 | 1075 | 1076 | 1077 | 1078 | 1079 | 1080 | 1081 | 1082 | 1083 | 1084 | 1085 | 1086 | 1087 | 1088 | 1089 | 1090 | 1091 | 1092 | 1093 | 1094 | 1095 | 1096 | 1097 | 1098 | 1099 | 1100 | 1101 | 1102 | 1103 | 1104 | 1105 | 1106 | 1107 | 1108 | 1109 | 1110 | 1111 | 1112 | 1113 | 1114 | 1115 | 1116 | 1117 | 1118 | 1119 | 1120 | 1121 | 1122 | 1123 | 1124 | 1125 | 1126 | 1127 | 1128 | 1129 | 1130 | 1131 | 1132 | 1133 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 | 1142 | 1143 | 1144 | 1145 | 1146 | 1147 | 1148 | 1149 | 1150 | 1151 | 1152 | 1153 | 1154 | 1155 | 1156 | 1157 | 1158 | 1159 | 1160 | 1161 | 1162 | 1163 | 1164 | 1165 | 1166 | 1167 | 1168 | 1169 | 1170 | 1171 | 1172 | 1173 | 1174 | 1175 | 1176 | 1177 | 1178 | 1179 | 1180 | 1181 | 1182 | 1183 | 1184 | 1185 | 1186 | 1187 | 1188 | 1189 | 1190 | 1191 | 1192 | 1193 | 1194 | 1195 | 1196 | 1197 | 1198 | 1199 | 1200 | 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 | 1208 | 1209 | 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 | 1217 | 1218 | 1219 | 1220 | 1221 | 1222 | 1223 | 1224 | 1225 | 1226 | 1227 | 1228 | 1229 | 1230 | 1231 | 1232 | 1233 | 1234 | 1235 | 1236 | 1237 | 1238 | 1239 | 1240 | 1241 | 1242 | 1243 | 1244 | 1245 | 1246 | 1247 | 1248 | 1249 | 1250 | 1251 | 1252 | 1253 | 1254 | 1255 | 1256 | 1257 | 1258 | 1259 | 1260 | 1261 | 1262 | 1263 | 1264 | 1265 | 1266 | 1267 | 1268 | 1269 | 1270 | 1271 | 1272 | 1273 | 1274 | 1275 | 1276 | 1277 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 | 1288 | 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 | 1296 | 1297 | 1298 | 1299 | 1300 | 1301 | 1302 | 1303 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 | 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 | 1320 | 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 | 1352 | 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 | 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 | 1368 | 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 | 1400 | 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 | 1416 | 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 | 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 | 1448 | 1449 | 1450 | 1451 |



CONTRACT NO. 12

**CONTRACTOR**

02821

[illegible]

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

**SUBMITTAL REGISTER**  
(ER 415 1-10)

**CONTRACT NO.**

(ER 415 1-10)

12

## TITLE AND LOCATION

**CONTRACTOR**

## SPECIFICATION SECTION

# Grand Forks Phase II Levees

**02832**

[illegible]

**SUBMITTAL REGISTER**  
(ER 415 1-10)

**CONTRACT NO.**

(ER 415 1-10)

12

## TITLE AND LOCATION

**CONTRACTOR**

## SPECIFICATION SECTION

# Grand Forks Phase II Levees

**02870**

[illegible]









**CONTRACT NO.**

(ER 415 1-10)

12

**CONTRACTOR**

**02930**

[illegible]



(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

CONTRACT NO. 12

(ER 415 1-10)

[illegible]

**CONTRACT NO.**

(ER 415 1-10)

12

12  
SPECIFICATION SECTION

### TITLE AND LOCATION

**CONTRACTOR**

## SPECIFICATION

# Grand Forks Phase II Levees

**03200**

[illegible]

**CONTRACT NO.**

(ER 415 1-10)

**CONTRACTOR**

# Grand Forks Phase II Levees

**03300**

ENG FORM 4288, Jul 96

**SPECSINTACT**

**PAGE 1 OF 1 PAGES**



CONTRACT NO. 12

(ER 415 1-10)

[illegible]



CONTRACT NO. 12

(ER 415 1-10)

[illegible]

**SUBMITTAL REGISTER**  
(ER 415 1-10)

**CONTRACT NO.**

(ER 415 1-10)

12

## TITLE AND LOCATION

**CONTRACTOR**

# Grand Forks Phase II Levees

**05055**

[illegible]

**CONTRACT NO.**

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**



(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

**CONTRACT NO.**

(ER 415 1-10)

12

**CONTRACTOR**

**05510**

ACT-V-

TRAN:  
MITTA  
NO.

IV- SPECIFICATION  
PARAGRAPH  
NUMBER

DESCRIPTION OF  
ITEM SUBMITTED**बं**

७.

ی

d.

எ

## Manufacturer's specifications and

## installation instructions

## Structural design calculations

## Materials

## Materials

ENG FORM 4288, Jul 96

## SPECSINTACT

**PAGE 1 OF 1 PAGES**

CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

**05615**

[illegible]

CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

**06100**

ACT - V

TRAN:  
MITTA  
NO.

| IV  | SPECIFICATION<br>PARAGRAPH<br>NUMBER |
|-----|--------------------------------------|
| 1   | 1                                    |
| 2   | 2                                    |
| 3   | 3                                    |
| 4   | 4                                    |
| 5   | 5                                    |
| 6   | 6                                    |
| 7   | 7                                    |
| 8   | 8                                    |
| 9   | 9                                    |
| 10  | 10                                   |
| 11  | 11                                   |
| 12  | 12                                   |
| 13  | 13                                   |
| 14  | 14                                   |
| 15  | 15                                   |
| 16  | 16                                   |
| 17  | 17                                   |
| 18  | 18                                   |
| 19  | 19                                   |
| 20  | 20                                   |
| 21  | 21                                   |
| 22  | 22                                   |
| 23  | 23                                   |
| 24  | 24                                   |
| 25  | 25                                   |
| 26  | 26                                   |
| 27  | 27                                   |
| 28  | 28                                   |
| 29  | 29                                   |
| 30  | 30                                   |
| 31  | 31                                   |
| 32  | 32                                   |
| 33  | 33                                   |
| 34  | 34                                   |
| 35  | 35                                   |
| 36  | 36                                   |
| 37  | 37                                   |
| 38  | 38                                   |
| 39  | 39                                   |
| 40  | 40                                   |
| 41  | 41                                   |
| 42  | 42                                   |
| 43  | 43                                   |
| 44  | 44                                   |
| 45  | 45                                   |
| 46  | 46                                   |
| 47  | 47                                   |
| 48  | 48                                   |
| 49  | 49                                   |
| 50  | 50                                   |
| 51  | 51                                   |
| 52  | 52                                   |
| 53  | 53                                   |
| 54  | 54                                   |
| 55  | 55                                   |
| 56  | 56                                   |
| 57  | 57                                   |
| 58  | 58                                   |
| 59  | 59                                   |
| 60  | 60                                   |
| 61  | 61                                   |
| 62  | 62                                   |
| 63  | 63                                   |
| 64  | 64                                   |
| 65  | 65                                   |
| 66  | 66                                   |
| 67  | 67                                   |
| 68  | 68                                   |
| 69  | 69                                   |
| 70  | 70                                   |
| 71  | 71                                   |
| 72  | 72                                   |
| 73  | 73                                   |
| 74  | 74                                   |
| 75  | 75                                   |
| 76  | 76                                   |
| 77  | 77                                   |
| 78  | 78                                   |
| 79  | 79                                   |
| 80  | 80                                   |
| 81  | 81                                   |
| 82  | 82                                   |
| 83  | 83                                   |
| 84  | 84                                   |
| 85  | 85                                   |
| 86  | 86                                   |
| 87  | 87                                   |
| 88  | 88                                   |
| 89  | 89                                   |
| 90  | 90                                   |
| 91  | 91                                   |
| 92  | 92                                   |
| 93  | 93                                   |
| 94  | 94                                   |
| 95  | 95                                   |
| 96  | 96                                   |
| 97  | 97                                   |
| 98  | 98                                   |
| 99  | 99                                   |
| 100 | 100                                  |

DESCRIPTION OF  
ITEM SUBMITTED

८

نى

व.

1

6

## 1.2 Structural Wood Members

## Structural/Engineered Wood

## Members

ENG FORM 4288, Jul 96

**SPECSINTACT**

**PAGE 1 OF 1 PAGES**



**SUBMITTAL REGISTER**  
(ER 415 1-10)

**CONTRACT NO.**

(ER 415 1-10)

### TITLE AND LOCATION

**CONTRACTOR**

## SPECIFICATION

# Grand Forks Phase II Levees

**07311**

[illegible]

SUBMITTAL REGISTER  
(ER 415 1-10)

CONTRACT NO.  
12

| TITLE AND LOCATION                             |                 | CONTRACTOR                     |                               | CONTRACTOR ACTION |   | GOVERNMENT ACTION |                           | SPECIFICATION SECTION |                   |                   |         |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--|-----------------|--------------------------------|-------------------------------|-------------------|---|-------------------|---------------------------|-----------------------|-------------------|-------------------|---------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Grand Forks Phase II Levees                    |                 |                                |                               |                   |   |                   |                           | 07412                 |                   |                   |         |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| A<br>C<br>T<br>I<br>V<br>I<br>T<br>Y<br>N<br>O | TRANSMITTAL NO. | SPECIFICATION PARAGRAPH NUMBER | DESCRIPTION OF ITEM SUBMITTED | TYPE OF SUBMITTAL |   | CLASSIFICATION    | CONTRACTOR SCHEDULE DATES |                       | CONTRACTOR ACTION | GOVERNMENT ACTION | REMARKS |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|  |                 |                                |                               | 1                 | 2 |                   | 3                         | 4                     |                   |                   |         | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 | 1016 | 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 | 1024 | 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 | 1032 | 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 1040 | 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 | 1048 | 1049 | 1050 | 1051 | 1052 | 1053 | 1054 | 1055 | 1056 | 1057 | 1058 | 1059 | 1060 | 1061 | 1062 | 1063 | 1064 | 1065 | 1066 | 1067 | 1068 | 1069 | 1070 | 1071 | 1072 | 1073 | 1074 | 1075 | 1076 | 1077 | 1078 | 1079 | 1080 | 1081 | 1082 | 1083 | 1084 | 1085 | 1086 | 1087 | 1088 | 1089 | 1090 | 1091 | 1092 | 1093 | 1094 | 1095 | 1096 | 1097 | 1098 | 1099 | 1100 | 1101 | 1102 | 1103 | 1104 | 1105 | 1106 | 1107 | 1108 | 1109 | 1110 | 1111 | 1112 | 1113 | 1114 | 1115 | 1116 | 1117 | 1118 | 1119 | 1120 | 1121 | 1122 | 1123 | 1124 | 1125 | 1126 | 1127 | 1128 | 1129 | 1130 | 1131 | 1132 | 1133 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 | 1142 | 1143 | 1144 | 1145 | 1146 | 1147 | 1148 | 1149 | 1150 | 1151 | 1152 | 1153 | 1154 | 1155 | 1156 | 1157 | 1158 | 1159 | 1160 | 1161 | 1162 | 1163 | 1164 | 1165 | 1166 | 1167 | 1168 | 1169 | 1170 | 1171 | 1172 | 1173 | 1174 | 1175 | 1176 | 1177 | 1178 | 1179 | 1180 | 1181 | 1182 | 1183 | 1184 | 1185 | 1186 | 1187 | 1188 | 1189 | 1190 | 1191 | 1192 | 1193 | 1194 | 1195 | 1196 | 1197 | 1198 | 1199 | 1200 | 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 | 1208 | 1209 | 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 | 1217 | 1218 | 1219 | 1220 | 1221 | 1222 | 1223 | 1224 | 1225 | 1226 | 1227 | 1228 | 1229 | 1230 | 1231 | 1232 | 1233 | 1234 | 1235 | 1236 | 1237 | 1238 | 1239 | 1240 | 1241 | 1242 | 1243 | 1244 | 1245 | 1246 | 1247 | 1248 | 1249 | 1250 | 1251 | 1252 | 1253 | 1254 | 1255 | 1256 | 1257 | 1258 | 1259 | 1260 | 1261 | 1262 | 1263 | 1264 | 1265 | 1266 | 1267 | 1268 | 1269 | 1270 | 1271 | 1272 | 1273 | 1274 | 1275 | 1276 | 1277 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 | 1288 | 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 | 1296 | 1297 | 1298 | 1299 | 1300 | 1301 | 1302 | 1303 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 | 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 | 1320 | 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 | 1352 | 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 | 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 | 1368 | 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 | 1400 | 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 | 1416 | 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 | 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 | 1448 |

CONTRACT NO. 12

(ER 415 1-10)

[illegible]





CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

**08520**

ENG FORM 4288, Jul 96

**SPECSINTACT**

**PAGE 1 OF 1 PAGES**

CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

**08625**

ENG FORM 4288, Jul 96

**SPECSINTACT**

**PAGE 1 OF 1 PAGES**

CONTRACT NO. 12

(ER 415 1-10)

[illegible]









CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

**09915**

ENG FORM 4288, Jul 96

**SPECSINTACT**

**PAGE 1 OF 1 PAGES**

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

10430

[illegible]

CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

10440

[illegible]

CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

10800

[illegible]



SUBMITTAL REGISTER

CONTRACT NO.

(ER 415 1-10)

| TITLE AND LOCATION          |  | CONTRACTOR                     |  | CONTRACTOR ACTION             |  | GOVERNMENT ACTION |  | SPECIFICATION SECTION |  |
|-----------------------------|--|--------------------------------|--|-------------------------------|--|-------------------|--|-----------------------|--|
| Grand Forks Phase II Levees |  |                                |  |                               |  |                   |  | 14600                 |  |
| TRANSMITTAL NO.             |  | SPECIFICATION PARAGRAPH NUMBER |  | DESCRIPTION OF ITEM SUBMITTED |  | TYPE OF SUBMITTAL |  | CLASSIFICATION        |  |
| a.                          |  | b.                             |  | c.                            |  | d.                |  | e.                    |  |
| f.                          |  | g.                             |  | h.                            |  | i.                |  | j.                    |  |
| k.                          |  | l.                             |  | m.                            |  | n.                |  | o.                    |  |
| p.                          |  | q.                             |  | r.                            |  | s.                |  | t.                    |  |
| u.                          |  | v.                             |  | w.                            |  | x.                |  | y.                    |  |
| z.                          |  | aa.                            |  | ab.                           |  | ac.               |  | ad.                   |  |
| ae.                         |  | af.                            |  | ag.                           |  | ah.               |  | ai.                   |  |
| aj.                         |  | ak.                            |  | al.                           |  | am.               |  | an.                   |  |
| ao.                         |  | ap.                            |  | aq.                           |  | ar.               |  | as.                   |  |
| at.                         |  | au.                            |  | av.                           |  | aw.               |  | ax.                   |  |
| ay.                         |  | az.                            |  | ba.                           |  | bb.               |  | bc.                   |  |
| bd.                         |  | be.                            |  | bf.                           |  | bg.               |  | bh.                   |  |
| bi.                         |  | bj.                            |  | bk.                           |  | bl.               |  | bm.                   |  |
| bn.                         |  | bo.                            |  | bp.                           |  | bq.               |  | br.                   |  |
| bs.                         |  | bt.                            |  | bu.                           |  | bv.               |  | bw.                   |  |
| bx.                         |  | by.                            |  | bz.                           |  | ca.               |  | cb.                   |  |
| cc.                         |  | cd.                            |  | ce.                           |  | cf.               |  | cg.                   |  |
| ch.                         |  | ci.                            |  | cj.                           |  | ck.               |  | cl.                   |  |
| cm.                         |  | cn.                            |  | co.                           |  | cp.               |  | cq.                   |  |
| cr.                         |  | cs.                            |  | ct.                           |  | cu.               |  | cv.                   |  |
| cw.                         |  | cx.                            |  | cy.                           |  | cz.               |  | da.                   |  |
| db.                         |  | dc.                            |  | dd.                           |  | de.               |  | df.                   |  |
| dg.                         |  | dh.                            |  | di.                           |  | dj.               |  | dk.                   |  |
| dl.                         |  | dm.                            |  | dn.                           |  | do.               |  | dp.                   |  |
| dq.                         |  | dr.                            |  | ds.                           |  | dt.               |  | du.                   |  |
| dv.                         |  | dw.                            |  | dx.                           |  | dy.               |  | dz.                   |  |
| ea.                         |  | eb.                            |  | ec.                           |  | ed.               |  | ee.                   |  |
| ef.                         |  | eg.                            |  | eh.                           |  | ei.               |  | ej.                   |  |
| ek.                         |  | el.                            |  | em.                           |  | en.               |  | eo.                   |  |
| ep.                         |  | eq.                            |  | er.                           |  | es.               |  | et.                   |  |
| eu.                         |  | ev.                            |  | ew.                           |  | ex.               |  | ey.                   |  |
| ez.                         |  | fa.                            |  | fb.                           |  | fc.               |  | fd.                   |  |
| fe.                         |  | ff.                            |  | fg.                           |  | fh.               |  | fi.                   |  |
| fj.                         |  | fk.                            |  | fl.                           |  | fm.               |  | fn.                   |  |
| fo.                         |  | fp.                            |  | fq.                           |  | fr.               |  | fs.                   |  |
| ft.                         |  | fu.                            |  | fv.                           |  | fw.               |  | fx.                   |  |
| fy.                         |  | fz.                            |  | ga.                           |  | gb.               |  | gc.                   |  |
| gd.                         |  | ge.                            |  | gf.                           |  | gg.               |  | gh.                   |  |
| gi.                         |  | gj.                            |  | gk.                           |  | gl.               |  | gm.                   |  |
| gn.                         |  | go.                            |  | gp.                           |  | gq.               |  | gr.                   |  |
| gs.                         |  | gt.                            |  | gu.                           |  | gv.               |  | gw.                   |  |
| gx.                         |  | gy.                            |  | gz.                           |  | ha.               |  | hb.                   |  |
| hc.                         |  | hd.                            |  | he.                           |  | hf.               |  | hg.                   |  |
| hh.                         |  | hi.                            |  | hj.                           |  | hk.               |  | hl.                   |  |
| hm.                         |  | hn.                            |  | ho.                           |  | hp.               |  | hq.                   |  |
| hr.                         |  | hs.                            |  | ht.                           |  | hu.               |  | hv.                   |  |
| hw.                         |  | hx.                            |  | hy.                           |  | hz.               |  | ia.                   |  |
| ib.                         |  | ic.                            |  | id.                           |  | ie.               |  | if.                   |  |
| ig.                         |  | ih.                            |  | ii.                           |  | ij.               |  | ik.                   |  |
| il.                         |  | im.                            |  | in.                           |  | io.               |  | ip.                   |  |
| iq.                         |  | ir.                            |  | is.                           |  | it.               |  | iu.                   |  |
| iv.                         |  | iw.                            |  | ix.                           |  | iy.               |  | iz.                   |  |
| ja.                         |  | jb.                            |  | jc.                           |  | jd.               |  | je.                   |  |
| jf.                         |  | jg.                            |  | jh.                           |  | ji.               |  | jj.                   |  |
| jk.                         |  | jl.                            |  | jm.                           |  | jn.               |  | jo.                   |  |
| jp.                         |  | jq.                            |  | jr.                           |  | js.               |  | jt.                   |  |
| ju.                         |  | jv.                            |  | jw.                           |  | jx.               |  | jy.                   |  |
| jz.                         |  | ka.                            |  | kb.                           |  | kc.               |  | kd.                   |  |
| ke.                         |  | kf.                            |  | kg.                           |  | kh.               |  | ki.                   |  |
| kj.                         |  | kk.                            |  | kl.                           |  | km.               |  | kn.                   |  |
| ko.                         |  | kp.                            |  | kq.                           |  | kr.               |  | ks.                   |  |
| kt.                         |  | ku.                            |  | kv.                           |  | kw.               |  | kx.                   |  |
| ky.                         |  | kz.                            |  | la.                           |  | lb.               |  | lc.                   |  |
| ld.                         |  | le.                            |  | lf.                           |  | lg.               |  | lh.                   |  |
| li.                         |  | lj.                            |  | lk.                           |  | ll.               |  | lm.                   |  |
| ln.                         |  | lo.                            |  | lp.                           |  | lq.               |  | lr.                   |  |
| ls.                         |  | lt.                            |  | lu.                           |  | lv.               |  | lw.                   |  |
| lx.                         |  | ly.                            |  | lz.                           |  | ma.               |  | mb.                   |  |
| mc.                         |  | md.                            |  | me.                           |  | mf.               |  | mg.                   |  |
| mh.                         |  | mi.                            |  | mj.                           |  | mk.               |  | ml.                   |  |
| mn.                         |  | mo.                            |  | mp.                           |  | mq.               |  | mr.                   |  |
| ms.                         |  | mt.                            |  | mu.                           |  | mv.               |  | mw.                   |  |
| mx.                         |  | my.                            |  | mz.                           |  | na.               |  | nb.                   |  |
| nc.                         |  | nd.                            |  | ne.                           |  | nf.               |  | ng.                   |  |
| nh.                         |  | ni.                            |  | nj.                           |  | nk.               |  | nl.                   |  |
| no.                         |  | np.                            |  | nq.                           |  | nr.               |  | ns.                   |  |
| nt.                         |  | nu.                            |  | nv.                           |  | nw.               |  | nx.                   |  |
| ny.                         |  | nz.                            |  | oa.                           |  | ob.               |  | oc.                   |  |
| od.                         |  | oe.                            |  | of.                           |  | og.               |  | oh.                   |  |
| oi.                         |  | oj.                            |  | ok.                           |  | ol.               |  | om.                   |  |
| on.                         |  | oo.                            |  | op.                           |  | oq.               |  | or.                   |  |
| os.                         |  | ot.                            |  | ou.                           |  | ov.               |  | ow.                   |  |
| ox.                         |  | oy.                            |  | oz.                           |  | pa.               |  | pb.                   |  |
| pc.                         |  | pd.                            |  | pe.                           |  | pf.               |  | pg.                   |  |
| ph.                         |  | pi.                            |  | pj.                           |  | pk.               |  | pl.                   |  |
| pm.                         |  | pn.                            |  | po.                           |  | pp.               |  | pq.                   |  |
| pr.                         |  | ps.                            |  | pt.                           |  | pu.               |  | pv.                   |  |
| pw.                         |  | px.                            |  | py.                           |  | pz.               |  | qa.                   |  |
| qb.                         |  | qc.                            |  | qd.                           |  | qe.               |  | qf.                   |  |
| qg.                         |  | qh.                            |  | qi.                           |  | qj.               |  | qk.                   |  |
| ql.                         |  | qm.                            |  | qn.                           |  | qo.               |  | qp.                   |  |
| qq.                         |  | qr.                            |  | qs.                           |  | qt.               |  | qu.                   |  |
| qv.                         |  | qw.                            |  | qx.                           |  | qy.               |  | qz.                   |  |
| ra.                         |  | rb.                            |  | rc.                           |  | rd.               |  | re.                   |  |
| rf.                         |  | rg.                            |  | rh.                           |  | ri.               |  | rj.                   |  |
| rk.                         |  | rl.                            |  | rm.                           |  | rn.               |  | ro.                   |  |
| rp.                         |  | rq.                            |  | rr.                           |  | rs.               |  | rt.                   |  |
| ru.                         |  | rv.                            |  | rw.                           |  | rx.               |  | ry.                   |  |
| rz.                         |  | sa.                            |  | sb.                           |  | sc.               |  | sd.                   |  |
| se.                         |  | sf.                            |  | sg.                           |  | sh.               |  | si.                   |  |
| sj.                         |  | sk.                            |  | sl.                           |  | sm.               |  | sn.                   |  |
| so.                         |  | sp.                            |  | sq.                           |  | sr.               |  | ss.                   |  |
| st.                         |  | su.                            |  | sv.                           |  | sw.               |  | sx.                   |  |
| sy.                         |  | sz.                            |  | ta.                           |  | tb.               |  | tc.                   |  |
| td.                         |  | te.                            |  | tf.                           |  | tg.               |  | th.                   |  |
| ti.                         |  | tj.                            |  | tk.                           |  | tl.               |  | tm.                   |  |
| tn.                         |  | to.                            |  | tp.                           |  | tq.               |  | tr.                   |  |
| ts.                         |  | tt.                            |  | tu.                           |  | tv.               |  | tw.                   |  |
| tx.                         |  | ty.                            |  | tz.                           |  | ua.               |  | ub.                   |  |
| uc.                         |  | ud.                            |  | ue.                           |  | uf.               |  | ug.                   |  |
| uh.                         |  | ui.                            |  | uj.                           |  | uk.               |  | ul.                   |  |
| um.                         |  | un.                            |  | uo.                           |  | up.               |  | uq.                   |  |
| ur.                         |  | us.                            |  | ut.                           |  | uv.               |  | uw.                   |  |
| ux.                         |  | uy.                            |  | uz.                           |  | va.               |  | vb.                   |  |
| vc.                         |  | vd.                            |  | ve.                           |  | vf.               |  | vg.                   |  |
| vh.                         |  | vi.                            |  | vj.                           |  | vk.               |  | vl.                   |  |
| vm.                         |  | vn.                            |  | vo.                           |  | vp.               |  | vq.                   |  |
| vr.                         |  | vs.                            |  | vt.                           |  | vu.               |  | vv.                   |  |
| vw.                         |  | vx.                            |  | vy.                           |  | vz.               |  | wa.                   |  |
| wb.                         |  | wc.                            |  | wd.                           |  | we.               |  | wf.                   |  |
| wg.                         |  | wh.                            |  | wi.                           |  | wj.               |  | wk.                   |  |
| wl.                         |  | wm.                            |  | wn.                           |  | wo.               |  | wp.                   |  |
| wq.                         |  | wr.                            |  | ws.                           |  | wt.               |  | wu.                   |  |
| wv.                         |  | ww.                            |  | wx.                           |  | wy.               |  | wz.                   |  |
| xa.                         |  | xb.                            |  | xc.                           |  | xd.               |  | xe.                   |  |
| xf.                         |  | xg.                            |  | xh.                           |  | xi.               |  | xj.                   |  |
| xk.                         |  | xl.                            |  | xm.                           |  | xn.               |  | xo.                   |  |
| xp.                         |  | xq.                            |  | xr.                           |  | xs.               |  | xt.                   |  |
| xu.                         |  | xv.                            |  | xw.                           |  | xx.               |  | xy.                   |  |
| xz.                         |  | ya.                            |  | yb.                           |  | yc.               |  | yd.                   |  |
| ye.                         |  | yf.                            |  | yg.                           |  | yh.               |  | yi.                   |  |
| yj.                         |  | yk.                            |  | yl.                           |  | ym.               |  | yn.                   |  |
| yo.                         |  | yp.                            |  | yq.                           |  | yr.               |  | ys.                   |  |
| yt.                         |  | yu.                            |  | yv.                           |  | yw.               |  | yz.                   |  |
| za.                         |  | zb.                            |  | zc.                           |  | zd.               |  | ze.                   |  |
| zf.                         |  | zg.                            |  | zh.                           |  | zi.               |  | zj.                   |  |
| zk.                         |  | zl.                            |  | zm.                           |  | zn.               |  | zo.                   |  |
| zp.                         |  | zq.                            |  | zr.                           |  | zs.               |  | zt.                   |  |
| zu.                         |  | zv.                            |  | zw.                           |  | zx.               |  | zy.                   |  |
| zz.                         |  | aa.                            |  | ab.                           |  | ac.               |  | ad.                   |  |



CONTRACT NO. 12

(ER 415 1-10)

[illegible]

CONTRACT NO. 12

**CONTRACTOR**

# Grand Forks Phase II Levees

15161

ENG FORM 4288, Jul 96

**SPECSINTACT**

**PAGE 1 OF 1 PAGES**

CONTRACT NO. 12

(ER 415 1-10)

| TITLE AND LOCATION          |                                |                               |                   | CONTRACTOR                   |                           | SPECIFICATION SECTION |                   |      |                   |      |         |    |  |  |  |
|-----------------------------|--------------------------------|-------------------------------|-------------------|------------------------------|---------------------------|-----------------------|-------------------|------|-------------------|------|---------|----|--|--|--|
| Grand Forks Phase II Levees |                                |                               |                   |                              |                           | 15250                 |                   |      |                   |      |         |    |  |  |  |
| TRAN: MITT# NO.             | SPECIFICATION PARAGRAPH NUMBER | DESCRIPTION OF ITEM SUBMITTED | TYPE OF SUBMITTAL | CLASSIFICATION               | CONTRACTOR SCHEDULE DATES |                       | CONTRACTOR ACTION |      | GOVERNMENT ACTION |      | REMARKS |    |  |  |  |
|                             |                                |                               |                   |                              | DATE                      | DATE                  | DATE              | DATE | DATE              | DATE |         |    |  |  |  |
| a.                          | b.                             | c.                            | d.                | e.                           | f.                        | g.                    | h.                | i.   | j.                | k.   | l.      | m. |  |  |  |
|                             |                                | 1.3                           |                   | Thermal Insulation Materials |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |
|                             |                                |                               |                   |                              |                           |                       |                   |      |                   |      |         |    |  |  |  |

CONTRACT NO. 12

(ER 415 1-10)

[illegible]

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**



(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

(ER 415 1-10)

**PAGE 1 OF 1 PAGES**

**SUBMITTAL REGISTER**  
(ER 415 1-10)

**CONTRACT NO.**

(ER 415 1-10)

12

## TITLE AND LOCATION

**CONTRACTOR**

## SPECIFICATION SECTION

# Grand Forks Phase II Levees

16528

| TRANSMITTAL NO. |    | SPECIFICATION PARAGRAPH NUMBER | DESCRIPTION OF ITEM SUBMITTED | TYPE OF SUBMITTAL |    |    |    |    |    |    |    |    |    | CLASSIFICATION | CONTRACTOR SCHEDULE DATES |    |    | CONTRACTOR ACTION | GOVERNMENT ACTION |    |    | REMARKS |    |    |    |    |    |    |    |    |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------|----|--------------------------------|-------------------------------|-------------------|----|----|----|----|----|----|----|----|----|----------------|---------------------------|----|----|-------------------|-------------------|----|----|---------|----|----|----|----|----|----|----|----|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| a.              | b. |                                |                               | c.                | d. | e. | f. | g. | h. | i. | j. | k. | l. |                | m.                        | n. | o. |                   | p.                | q. | r. |         | s. | t. | u. | v. | w. | x. | y. | z. | aa. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                 |    |                                |                               |                   |    |    |    |    |    |    |    |    |    |                |                           |    |    |                   |                   |    |    |         |    |    |    |    |    |    |    |    |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01410

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

- 1.1 GENERAL REQUIREMENTS
  - 1.1.1 Subcontractors
  - 1.1.2 Definitions
- 1.2 SUBMITTALS
- 1.3 ENVIRONMENTAL PROTECTION PLAN
  - 1.3.1 Implementation.
  - 1.3.2 Compliance.
  - 1.3.3 Contents.
- 1.4 PERMITS
- 1.5 NOTIFICATION
- 1.6 PREVIOUSLY USED EQUIPMENT
- 1.7 PAYMENT

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

- 3.1 ENVIRONMENTAL RESOURCES.
- 3.2 LAND RESOURCES
  - 3.2.1 Work Area Limits
  - 3.2.2 Landscape
  - 3.2.3 Unprotected Erodible Soils
  - 3.2.4 Disturbed Areas
  - 3.2.5 Contractor Facilities and Work Areas
- 3.3 WATER RESOURCES
  - 3.3.1 Washing and Curing Water
  - 3.3.2 Cofferdam and Diversion Operations
  - 3.3.3 Stream Crossings
  - 3.3.4 Fish and Wildlife
  - 3.3.5 Fuel Handling
- 3.4 AIR RESOURCES
  - 3.4.1 Particulates
  - 3.4.2 Hydrocarbons and Carbon Monoxide
  - 3.4.3 Odors
  - 3.4.4 Sound Intrusions
- 3.5 WASTE DISPOSAL
  - 3.5.1 Solid Wastes
  - 3.5.2 Chemical Wastes
- 3.6 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES
- 3.7 POST CONSTRUCTION CLEANUP
- 3.8 RESTORATION OF LANDSCAPE DAMAGE
- 3.9 MAINTENANCE OF POLLUTION FACILITIES
- 3.10 TRAINING OF CONTRACTOR PERSONNEL

-- End of Section Table of Contents --



SECTION 01410

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

The Contractor shall perform the work minimizing environmental pollution and damage as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract.

1.1.1 Subcontractors

The Contractor shall insure that its subcontractors comply with the requirements of this section.

1.1.2 Definitions

For the purpose of this specification, environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural, and/or historical purposes. The control of environmental pollution and damage requires consideration of air, water, and land, and includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants.

1.2 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following items shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-08 Statements

Environmental Protection Plan; GA.

The Environmental Protection Plan shall be prepared in accordance with Paragraph ENVIRONMENTAL PROTECTION PLAN.

1.3 ENVIRONMENTAL PROTECTION PLAN

1.3.1 Implementation.

Prior to ordering required materials/equipment or commencing construction work, the Contractor shall:

- a. Submit to the Contracting Officer an acceptable written Environmental Protection Plan;
- b. Obtain the Contracting Officer's written acceptance of the

Environmental Protection Plan; and

c. Meet with representatives of the Contracting Officer for the purpose of developing an understanding of the requirements and methods of administration of the Contractor's Environmental Protection Plan.

1.3.2 Compliance.

Notwithstanding the requirements of this section and not withstanding approval by the Contracting Officer of the Contractor's Environmental Protection Plan, nothing herein shall be construed as relieving the Contractor of all applicable Federal, State, and local environmental protection laws and regulations.

1.3.3 Contents.

The Environmental Protection Plan shall include, but shall not be limited to, the following:

- a. Name(s) of person(s) within the Contractor's on-site organization who is(are) responsible for ensuring that the Environmental Protection Plan is adhered to.
- b. Meeting times and personnel attendance for communication and notification of personnel and subcontractors regarding environmental requirements, and name(s) of person(s) responsible for this training.
- c. The Contractor shall prepare a listing of resources needing protection, (i.e., trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, and historical, archaeological, and cultural resources); and what methods will be used to protect these resources.
- d. Name(s) of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.
- e. Procedures to be implemented to provide the required environmental protection, to comply with the applicable laws and regulations, and to correct pollution due to accident, natural causes, or failure to follow the procedures of the Environmental Protection Plan.
- f. Methods and locations for waste disposal. Licenses or permits shall be submitted for solid waste disposal sites that are not an operating commercial facility. Evidence of disposal facility acceptance shall be submitted for any hazardous or toxic waste.
- g. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.
- h. Environmental monitoring plans for the job site, including land, water, air, and noise monitoring.
- i. Traffic control plans.
- j. Methods of protecting surface and ground water during construction



activities.

- k. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas.
- l. Drawing of borrow areas.
- m. Plans for restoration of landscape damage.
- n. Provide video tape of the borrow areas, all haul roads, and construction areas prior to beginning work.

#### 1.4 PERMITS

Permits obtained by the Government related to the work of this contract are attached in Section 00830 ATTACHMENTS, or referenced in Section 01000 GENERAL. The Contractor is responsible for obtaining all applicable permits or licenses (those not obtained by the Government). The Contractor shall be responsible for implementing the terms and requirements of the permits held by the Contractor or the Government. A copy of permits referenced in Section 01000 GENERAL are available for inspection in the Office of the District Engineer, Army Corps of Engineers Centre, 190 Fifth Street East, St. Paul, Minnesota 55101-1638.

#### 1.5 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with the previously mentioned Federal, State or local laws or regulations, permits, and other elements of the Contractor's Environmental Protection Plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action when approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping (suspending) all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to the Contractor for any such suspensions. Failure of the Contracting Officer to notify the Contractor of any noncompliance with Federal, State, or local laws or regulations does not relieve the Contractor of the obligation to be in conformance with those requirements.

#### 1.6 PREVIOUSLY USED EQUIPMENT

The Contractor shall thoroughly clean all construction equipment previously used at other sites before it is brought into the work areas, ensuring that soil residuals are removed and that egg deposits from plant pests are not present; the Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

#### 1.7 PAYMENT

No separate payment or direct payment will be made for work covered under this section and such work will be considered as a subsidiary obligation of the Contractor.

#### PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

### 3.1 ENVIRONMENTAL RESOURCES.

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine its activities to areas defined by the drawings and specifications.

### 3.2 LAND RESOURCES

Prior to the beginning of any construction, the Contractor shall identify all land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without permission from the Contracting Officer. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, earth or other material displaced into uncleared areas shall be removed.

#### 3.2.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

#### 3.2.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

#### 3.2.3 Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in cases where the constructed feature obscures borrow areas, quarries, and waste material areas, these areas shall not initially be totally cleared. Clearing of such areas shall progress in reasonably sized increments as needed to use the developed areas as approved by the Contracting Officer.

#### 3.2.4 Disturbed Areas

The Contractor shall effectively prevent erosion and control sedimentation through approved methods including, but not limited to, the following:

- a. Retardation and control of runoff. Runoff from the construction site or from storms shall be controlled, retarded, and diverted to protected drainage courses by means of diversion ditches, benches,

berms, and by any measures required by area wide plans under the Clean Water Act.

- b. Erosion and sedimentation control devices. The Contractor shall construct or install temporary and permanent erosion and sedimentation control features as indicated or required. Berms, dikes, drains, sedimentation basins, grassing, and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.
- c. Sediment basins. Sediment from construction areas shall be trapped in temporary or permanent sediment basins. The sediment basins shall be constructed in accordance with basin plans when shown on the drawings. The basins shall accommodate the runoff of a local 5 year storm, except that the design storm event required by the watershed district, watershed management board, or similar governing agency shall be used if available. After each storm, the basins shall be pumped dry and accumulated sediment shall be removed to maintain basin effectiveness. Overflow shall be controlled by paved weirs or by vertical overflow pipes. The collected topsoil sediment shall be reused for fill on the construction site, and/or stockpiled for use at another site. The Contractor shall institute effluent quality monitoring programs as required by State and local environmental agencies.

#### 3.2.5 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Borrow areas shall be managed to minimize erosion and to prevent sediment from entering nearby waters. Spoil areas shall be managed and controlled to limit spoil intrusion into areas designated on the drawings and to prevent erosion of soil or sediment from entering nearby waters. Spoil areas shall be developed in accordance with the grading plan indicated on the drawings. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

### 3.3 WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation when such application may cause contamination of the fresh water reserve. Monitoring of water areas affected by construction shall be the Contractor's responsibility. All water areas affected by construction activities shall be monitored by the Contractor.

#### 3.3.1 Washing and Curing Water

Waste waters directly derived from construction activities shall not be allowed to enter water areas. Waste waters shall be collected and placed in retention ponds where suspended material can be settled out or the water evaporates to separate pollutants from the water.

#### 3.3.2 Cofferdam and Diversion Operations

Construction operations for dewatering, and removal of cofferdams, shall

be controlled at all times to limit the impact of water turbidity on the habitat for wildlife and on water quality for downstream use. The Contractor shall plan its operations and perform all work necessary to minimize adverse impact or violation of the water quality standards applicable to this contract.

#### 3.3.3 Stream Crossings

Stream crossings shall be controlled during construction. Crossings shall provide movement of materials or equipment which do not violate water pollution control standards of Federal, State, or local governments.

#### 3.3.4 Fish and Wildlife

The Contractor shall minimize interference with, disturbance to, and damage of fish and wildlife. Species that require specific attention along with measures for their protection shall be listed by the Contractor prior to beginning of construction operations.

#### 3.3.5 Fuel Handling

The Contractor shall provide containment around fueling areas to ensure that spills do not reach waters of the state.

### 3.4 AIR RESOURCES

Equipment operation and activities or processes performed by the Contractor in accomplishing the specified construction shall be in accordance with State air pollution statutes, rules, and regulations and all Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained. Monitoring of air quality shall be the Contractor's responsibility. All air areas affected by the construction activities shall be monitored by the Contractor.

#### 3.4.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

#### 3.4.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

#### 3.4.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

#### 3.4.4 Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise. The Contractor shall use methods and devices to control noise emitted by equipment to within the levels specified in the "Safety and Health Requirements Manual" referenced in the clause "Accident Prevention" in Section 00700 CONTRACT CLAUSES.

### 3.5 WASTE DISPOSAL

The Contracting Officer shall be informed of any waste disposal requirements identified during the work and not covered in the Environmental Protection Plan. Waste disposal plans shall be updated and submitted as required

#### 3.5.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Project Site and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. The Contractor shall comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

#### 3.5.2 Chemical Wastes

Chemical waste shall be stored in corrosion resistant containers, removed from the work areas, and disposed of in accordance with Federal, State, and local laws and regulations.

### 3.6 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Existing historical, archaeological, and cultural resources within the Contractor's work area will be so designated by the Contracting Officer if any have been identified. The Contractor shall take precautions to preserve all such resources as they existed at the time they were first pointed out. The Contractor shall provide and install protection for these resources and be responsible for their preservation during the life of the contract. If during excavation or other construction activities any previously unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rocks or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer.

### 3.7 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction.

### 3.8 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the neat lines of project features. Such restoration shall be in accordance with the Environmental Protection Plan. This work shall be accomplished at the Contractor's expense and at no additional cost to the Government.

### 3.9 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

### 3.10 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities, devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental pollution control.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 PAYMENT

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

- 3.1 GENERAL REQUIREMENTS
- 3.2 QUALITY CONTROL PLAN
  - 3.2.1 General
  - 3.2.2 Content of the CQC Plan
  - 3.2.3 Acceptance of Plan
  - 3.2.4 Notification of Changes
- 3.3 COORDINATION MEETING
- 3.4 QUALITY CONTROL ORGANIZATION
  - 3.4.1 Personnel Requirements
  - 3.4.2 CQC System Manager
  - 3.4.3 Additional Requirement
  - 3.4.4 Organizational Changes
- 3.5 SUBMITTALS AND DELIVERABLES
- 3.6 CONTROL
  - 3.6.1 Preparatory Phase
  - 3.6.2 Initial Phase
  - 3.6.3 Follow-up Phase
  - 3.6.4 Additional Preparatory and Initial Phases
- 3.7 TESTS
  - 3.7.1 Testing Procedure
  - 3.7.2 Testing Laboratories
    - 3.7.2.1 Capability Check
    - 3.7.2.2 Capability Recheck
  - 3.7.3 Onsite Laboratory
  - 3.7.4 Furnishing or Transportation of Samples for Testing
- 3.8 COMPLETION INSPECTION
  - 3.8.1 Punch-Out Inspection
  - 3.8.2 Pre-Final Inspection
  - 3.8.3 Final Acceptance Inspection
- 3.9 DOCUMENTATION
- 3.10 SAMPLE FORMS
- 3.11 NOTIFICATION OF NONCOMPLIANCE
- 3.12 IMPLEMENTATION OF GOVERNMENT RESIDENT MANAGEMENT SYSTEM FOR CONTRACTOR QUALITY CONTROL OF CONTRACT
  - 3.12.1 Revisions
  - 3.12.2 Pay Activity

-- End of Section Table of Contents --



SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740 (1999) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM E 329 (1998) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08 Statements

Contractor Quality Control (CQC) Plan; GA

The quality control plan shall be prepared in accordance with paragraph QUALITY CONTROL PLAN.

Laboratory Quality Management Manual; FIO

The manual as specified in paragraph TESTS - TESTING LABORATORIES - CAPABILITY CHECK shall be submitted.

SD-18 Records

Documentation of work; FIO

- a. Construction Quality Control Management Report
- b. CQC Report
- c. Preparatory Phase Checklist
- d. Initial Phase Checklist

Daily records and weekly reports shall be prepared in accordance with paragraph DOCUMENTATION.

### 1.3 PAYMENT

The Contractor shall be responsible for the work of this section, without any direct compensation being made other than the payment received for contract items.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production.

### 3.2 QUALITY CONTROL PLAN

#### 3.2.1 General

The Contractor shall furnish for review by the Government, not later than 15 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

#### 3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent or someone higher in the Contractor's organization.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)
- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

### 3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

### 3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

## 3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 10 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

### 3.4 QUALITY CONTROL ORGANIZATION

#### 3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The Contractor shall provide a CQC organization which shall be at the site at all times during progress of the work and with complete authority to take any action necessary to ensure compliance with the contract. All CQC staff members shall be subject to acceptance by the Contracting Officer.

#### 3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of 5 years experience in related duties on construction similar to this contract. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be independent from project superintendent and be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

#### 3.4.3 Additional Requirement

In addition to the above qualifications, the CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors". This course is periodically offered through the Government in the Minneapolis - St. Paul, Minnesota metropolitan area.

#### 3.4.4 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

### 3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

### 3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

#### 3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Discussion of the initial control phase.

- k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

#### 3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government shall be notified at least 48 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

#### 3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

#### 3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is

resumed after a substantial period of inactivity; or if other problems develop.

### 3.7 TESTS

#### 3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a testing laboratory meeting the requirements listed under paragraph CAPABILITY CHECK, or establish a testing laboratory at the project site meeting those requirements. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

#### 3.7.2 Testing Laboratories

##### 3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329. The Contractor shall submit a Quality Management Manual meeting the requirements of ASTM D 3740 and ASTM E 329 for each laboratory to be used, including on-site project laboratories.

##### 3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of \$1000.00 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently

selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

### 3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

### 3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Contracting Officer. Coordination for each specific test, exact delivery location, and dates will be made with the Contracting Officer.

## 3.8 COMPLETION INSPECTION

### 3.8.1 Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the Special Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. A punch list of items which do not conform to the approved drawings and specifications shall be prepared and included in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final Inspection.

### 3.8.2 Pre-Final Inspection

The Government will perform the Pre-Final Inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final Inspection with the customer can be scheduled. Any items noted on the Pre-Final Inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

### 3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance the Final Acceptance Inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The Final Acceptance Inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final Inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the Final Acceptance Inspection and shall include



the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the Final Acceptance Inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

### 3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.
- g. Off-site surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of

the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

### 3.10 SAMPLE FORMS

The following sample forms are enclosed at the end of this section:

- a. Construction Quality Control Management Report
- b. CQC Report
- c. Preparatory Phase Checklist
- d. Initial Phase Checklist

### 3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

### 3.12 IMPLEMENTATION OF GOVERNMENT RESIDENT MANAGEMENT SYSTEM FOR CONTRACTOR QUALITY CONTROL OF CONTRACT

The Contractor shall utilize the Contractor Quality Control (CQC) module of the Resident Management System (RMS). The RMS-CQC module is a computer program which is executable on IBM compatible computers with 80386, 80486 and Pentium processors. This module includes a daily CQC reporting form which must be used. The module shall be completed to the satisfaction of the Contracting Officer prior to any contract payment and shall be updated as required. The Contractor shall complete module elements including:

- Prime Contractor staffing
- Subcontractor information, including name, address, trade, and point of contact
- Submittal information, including description, activity number, review period, expected procurement period
- Quality control testing
- Definable features of work
- Installed property listing
- Transfer property listing
- Pay activity and activity information
- Planned cumulative progress earnings
- Scheduled employee education required by the specifications
- Insurance expiration dates

#### 3.12.1 Revisions

The Contractor shall acknowledge receipt of Government comments relating to

the RMS-CQC module by specific number reference on his Daily CQC report. The daily CQC report shall also report when corrections are implemented.

3.12.2 Pay Activity

The sum of all pay activity values shall equal the contract amount. Bid items may include multiple activities, but activities shall only be assigned to one bid item.

-- End of Section --

# CONSTRUCTION QUALITY CONTROL MANAGEMENT REPORT

Contractor Production

Contractor's Name

Daily Report No. \_\_\_\_\_ Date \_\_\_\_\_  
Contract No. \_\_\_\_\_

Project Title & Location: \_\_\_\_\_

Weather \_\_\_\_\_ Precipitation \_\_\_\_\_ in. Temp. \_\_\_\_\_ Min \_\_\_\_\_ Max \_\_\_\_\_

1. Contract/Subcontractors and Area of Responsibility:

[illegible]

2. Operating Plant or Equipment. (Not hand tools)

[illegible]

CQC Report

1. Work performed today: (Indicate location and description of work performed by prime and/or subcontractors by letter in table above).

---

---

---

---

---

---

---

---

2. Results of control activities: (Indicate whether P - Preparatory, I - Initial, or F - Follow-up Phase. When a P or I meeting is conducted, complete attachment 1-A or 1-B, respectively. When network analysis system is used, identify work by use of I-J numbers)

---

---

---

---

---

---

---

---

3. Test performed as required by plans and/or specifications:

---

---

---

---

---

---

---

---

4. Material received:

---

---

---

---

---

---

---

---

CQC Report (Cont'd)

5. Submittals Reviewed:

| (a) Submittal No. | (b) Spec/Plan Reference | (c) By Whom | (d) Action |
|-------------------|-------------------------|-------------|------------|
| _____             | _____                   | _____       | _____      |
| _____             | _____                   | _____       | _____      |
| _____             | _____                   | _____       | _____      |
| _____             | _____                   | _____       | _____      |
| _____             | _____                   | _____       | _____      |

6. Off-site surveillance activities, including action taken:

---

---

---

---

---

---

---

---

7. Job safety: (Report violations; Corrective instructions given; Corrective actions taken).

---

---

---

---

---

---

---

---

8. Remarks: (Instructions received or given. Conflict(s) in Plans and/or Specifications)

---

---

---

---

---

---

---

---

Contractor's Verification: On behalf of the Contractor, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

\_\_\_\_\_  
CQC System Manager

PREPARATORY PHASE CHECKLIST

Contract No.: \_\_\_\_\_ Date: \_\_\_\_\_  
Definable Feature: \_\_\_\_\_ Spec Section: \_\_\_\_\_

Government Rep Notified \_\_\_\_\_ Hours in Advance Yes \_\_\_\_ No \_\_\_\_

I. Personnel Present.

|   | Name  | Position | Company/Government |
|---|-------|----------|--------------------|
| 1 | _____ | _____    | _____              |
| 2 | _____ | _____    | _____              |
| 3 | _____ | _____    | _____              |
| 4 | _____ | _____    | _____              |
| 5 | _____ | _____    | _____              |
| 6 | _____ | _____    | _____              |
| 7 | _____ | _____    | _____              |

(List additional personnel on reverse side)

II. Submittals.

1. Review submittals and/or submittal log 4288. Have all submittals been approved? Yes \_\_\_\_ No \_\_\_\_

If No, what items have not been submitted?

a \_\_\_\_\_  
b \_\_\_\_\_  
c \_\_\_\_\_

2. Are all materials on hand? Yes \_\_\_\_ No \_\_\_\_

a \_\_\_\_\_  
b \_\_\_\_\_  
c \_\_\_\_\_

3. Check approved submittals against delivered material. (This should be done as material arrives).

Comments \_\_\_\_\_

III. Material Storage.

Are materials stored properly? Yes \_\_\_\_ No \_\_\_\_

If No, what action is taken?

Preparatory Phase Checklist (Cont'd)

IV. Specifications.

1. Review each paragraph of specifications.

---

---

---

2. Discuss procedure for accomplishing the work.

---

---

---

---

---

3. Clarify any differences.

---

---

---

---

V. Preliminary Work.

Ensure preliminary work is correct.

If not, what action is taken \_\_\_\_\_

---

VI. Testing.

1. Identify test to be performed, frequency, and by whom.

2. When required? \_\_\_\_\_

3. Where required \_\_\_\_\_

4. Review Testing Plan \_\_\_\_\_

5. Has test facilities been approved? \_\_\_\_\_

VII. Safety.

1. Review applicable portion of EM 385-1-1 \_\_\_\_\_

---

2. Activity Hazard Analysis approved? Yes \_\_\_\_\_ No \_\_\_\_\_

VIII. Corps of Engineers comments during meeting.

---

---

---

\_\_\_\_\_  
CQC System Manager



INITIAL PHASE CHECKLIST

Contract No. \_\_\_\_\_ Date \_\_\_\_\_

Definable Feature \_\_\_\_\_

Government Rep Notified \_\_\_\_\_ Hours in Advance Ye \_\_\_\_\_ No \_\_\_\_\_

I. Personnel Present:

|   | Name  | Position | Company/Government |
|---|-------|----------|--------------------|
| 1 | _____ | _____    | _____              |
| 2 | _____ | _____    | _____              |
| 3 | _____ | _____    | _____              |
| 4 | _____ | _____    | _____              |
| 5 | _____ | _____    | _____              |
| 6 | _____ | _____    | _____              |

(List additional personnel on reverse side)

II. Identify full compliance with procedures identified at preparatory.  
Coordinate plans, specifications, and submittals.

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

III. Preliminary Work. Ensure preliminary work is complete and correct.  
If not, what action is taken? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

IV. Establish Level of Workmanship.

1. Where is work located? \_\_\_\_\_
2. Is a sample panel required? Yes \_\_\_\_\_ N \_\_\_\_\_
3. Will the initial work be considered as a sample? Ye \_\_\_\_\_ N \_\_\_\_\_  
(If yes, maintain in present condition as long as possible).

V. Resolve any Differences.

Comments \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Review job conditions using EM 385-1-1 and job hazard analysis.

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
CQC System Manager

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

- 1.1 SUBMITTALS
- 1.2 AVAILABILITY AND USE OF UTILITY SERVICES
  - 1.2.1 Temporary Electrical Facilities
  - 1.2.2 Sanitation
  - 1.2.3 Telephone
- 1.3 PROTECTION AND MAINTENANCE OF TRAFFIC
  - 1.3.1 Haul Roads
  - 1.3.2 Barricades
- 1.4 CONTRACTOR'S TEMPORARY FACILITIES
  - 1.4.1 Administrative Field Offices
  - 1.4.2 Staging Area
- 1.5 PLANT COMMUNICATION
- 1.6 TEMPORARY PROJECT SAFETY FENCING
- 1.7 PAYMENT

PART 2 PRODUCTS

- 2.1 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN
  - 2.1.1 Bulletin Board
  - 2.1.2 Project and Safety Signs
- 2.2 GOVERNMENT FIELD OFFICE
  - 2.2.1 Location
  - 2.2.2 Construction
  - 2.2.3 Utilities.
  - 2.2.4 Furnishings
  - 2.2.5 Furniture
  - 2.2.6 Office Equipment
  - 2.2.7 Maintenance

PART 3 EXECUTION

- 3.1 CLEANUP
- 3.2 RESTORATION OF STORAGE AREA

-- End of Section Table of Contents --

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Site Plan; FIO.

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

Government Field Office; FIO.

The Contractor shall submit a preliminary plan and description of the mobile office facilities which it proposes to furnish prior to proceeding with procurement thereof.

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1 Temporary Electrical Facilities

The Contractor shall be responsible for coordination and costs for electrical power required for the Contractor's operations, including all costs for utility company hookup, installation/dismantling of transformers and distribution lines. In general, the Contractor shall establish its own service connection with the utility company. If the Contractor proposes to use an existing Government service connection, a request shall be submitted for approval to verify the Contractor's use will not interfere with operation of the facilities, and the monthly service fees will be paid for in whole (including Government power consumption) by the Contractor.

1.2.2 Sanitation

The Contractor shall provide and maintain within the construction area field-type sanitary facilities in accordance with EM 385-1-1. These facilities shall include but not be limited to toilet, washing, and drinking water facilities

1.2.3 Telephone

The Contractor shall make arrangements and pay all costs for their telephone facilities desired. Government personnel will not take or deliver messages for the Contractor.

### 1.3 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads.

#### 1.3.1 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

#### 1.3.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

### 1.4 CONTRACTOR'S TEMPORARY FACILITIES

#### 1.4.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

#### 1.4.2 Staging Area

The boundary limits of the grounds made available for the Contractor's use

during the life of the contract are shown on the drawings as Work Limits. Trailers, materials, or equipment shall not be placed or stored outside the work limits.

#### 1.5 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located that operation by normal voice between these elements is not satisfactory, the Contractor shall install a satisfactory means of communication, such as telephone or other suitable devices. The devices shall be made available for use by Government personnel.

#### 1.6 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, the Contractor shall furnish and erect temporary project safety fencing at the work site. The safety fencing shall be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers, generally located to encompass the active construction areas. The safety fencing shall be maintained by the Contractor during the life of the contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

#### 1.7 PAYMENT

The Contractor shall be responsible for the work of this section without any direct compensation being made other than payment received for contract items.

### PART 2 PRODUCTS

#### 2.1 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

##### 2.1.1 Bulletin Board

Immediately upon beginning of work, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the Contractor.

##### 2.1.2 Project and Safety Signs

The Contractor shall furnish and erect a Project sign and a Safety sign in a location selected by the Contracting Officer at the project site within 15 days after receipt of the notice to proceed. The requirements for the signs and their content shall be as shown on the drawings at the end of this section. The data required by the safety sign shall be corrected daily. Signs shall be maintained throughout the construction period, and upon completion of the project, the signs shall be removed from the site. The PROJECT DESCRIPTION and PROJECT NAME shall be as follows:

PROJECT DESCRIPTION: Flood Control Project  
Grand Forks, North Dakota

PROJECT NAME: Phase II Levees

2.2 GOVERNMENT FIELD OFFICE

The Contractor shall provide and maintain for the life of the contract an approved mobile office (mobile home style) meeting the following requirements as to space and facilities for the exclusive use of the Government. The unit shall be ready for occupancy within 30 calendar days after notice to proceed. The unit shall provide a minimum of 400 square feet of floor area and shall include two private offices, each having approximately 100 square feet of floor area and a storage closet. The unit shall have two entrance doors. The remaining space is to be utilized as one large office, a toilet room, a chest of drawers and a storage area for coats, etc. The unit shall be provided with a toilet room consisting of a stool and lavatory and an electric heater. The unit interior headroom shall be no less than a nominal 8'-0".

2.2.1 Location

The Contractor shall locate the portable mobile home type field office at or near the Contractor's field office site at a location approved by the Contracting Officer. Four parking spaces shall be reserved for Government vehicles at the Government trailer.

2.2.2 Construction.

The Government field office shall be similar in quality and age as the Contractor's field office, if provided. Exterior and interior finishes shall be free from color fade, chipping, or peeling. The unit shall be set level on blocking, be provided with plywood skirting, and be anchored to the ground for protection against wind damage. Exterior doors shall be provided with screens and outside hasps for use with padlocks. The unit shall be electrically wired for fluorescent ceiling lighting fixtures and weather proof porch lights at each entrance door, along with switches, duplex convenience outlets, and a master switch and fuse box as required. The entire unit shall be adequately insulated with fiberglass insulation and vapor barrier. Dead air crawl space shall be properly ventilated. Heating and air conditioning facilities shall be provided to maintain an ambient inside temperature of 68 degrees F. The unit shall be weather proof, and furnished with a forced air type heating plant, either gas or oil with hot and cold air ducts adequate to supply even heat throughout the unit. Air conditioning shall be furnished with capacity as recommended by the manufacturer for the trailer size. A central air conditioning system shall be provided.

2.2.3 Utilities.

The Contractor shall be responsible for service fees in connection with electrical power and heating (natural gas or oil service). The Contractor shall also be responsible for service fees in connection with the water supply, sanitary waste system, and telephone as indicated below. When available, city water and sewer system connections are preferred.

- a. Sanitary Facilities. In the absence of a city sewer connection, holding tanks shall be provided. The lavatory shall discharge into an outside underground holding tank with a capacity of not less than 400

gallons and a vented drain. The Contractor shall provide year-round pumping of the holding tank as required. Subject to approval, a serviced chemical toilet may be used.

b. Potable Water. In the absence of a city water connection, a potable water storage tank of not less than 300 gallons capacity shall be furnished with adequate supply filling connections and screened vent, and shall be stainless steel or plastic with a drain cock of not less than ½ inch size. Upon completion of the job, the Contractor shall remove the underground holding tank and backfill the excavation. The Contractor shall provide potable water for the storage tank if service connections are not provided.

c. Telephone. The Contractor shall be responsible for installation of telephone at the Government office. The telephone hook-up should be placed on a separate account from the Contractor's phone so that it can be transferred to the Government after installation. The Government will be responsible for the telephone service to the Government field office after installation.

#### 2.2.4 Furnishings.

The following furnishings shall be provided for the Government office:

- a. A hot and cold drinking water dispenser. The Contractor shall provide drinking water for the dispenser for the duration of the contract
- b. Bulletin board, minimum size 6 square feet
- c. A cabinet shall be supplied along a side wall with minimum nominal dimensions 2 feet wide, 3 feet high and 6 feet long. The cabinet shall include a finished wood or laminate counter. Two shelves, one above and one below the cabinet, shall be provided for storage.
- d. Sign. The contractor shall securely attach to the unit exterior and adjacent to the main entrance door, as approved, a 24 inch by 36 inch sign with the Corps of Engineers castle insignia with wording as specified
- e. Stoop. A stoop with 8 inch risers and handrails shall be provided at each entrance door.
- f. Windows. All windows shall be provided with sash and security screens along with shades, blinds or similar features that allow for the complete coverage of the windows on the inside.
- g. Lavatory. A 5 by 24 inch metal shelf and 15 by 20 inch wood or metal framed plate glass mirror shall be provided above the lavatory.

#### 2.2.5 Furniture

Office furniture shall be coordinated with respect to style, color, and upholstery. The following furniture shall be provided:

- a. Two desks either wood or steel, double pedestal type, top approximately 60 inches by 34 inches, with lock.
- b. Two swivel armchairs with tilting seat and adjustable spring back.
- c. Two filing cabinets, four-drawer legal size, with lock.
- d. One drafting table stool, non-tilting, rotary type with back and circular footrest.
- e. One drafting table, metal and/or wood, 36 inches by 48 inches
- f. One conference table, ¾ inch thick by 72 inches long by 36 inches wide with solid core construction top.
- g. Eight chairs for conference table, either wood or steel construction, with cushioned seat and backrest
- h. One rack for hanging full size drawings.

#### 2.2.6 Office Equipment

The following equipment shall be provided:

- a. One desk top facsimile (FAX) machine with modem BPS speeds of 9600,7200,4800, and 2400; an effective scanning width of 11.7 inches and line scanning density of 8 pels/mm horizontal and an effective scanning width of 7.7 inches and line scanning density of 3.85 lines/mm vertical. Initially supply four reams of paper(500 sheets per ream).
- b. One desk top copying machine with an indirect dual component dry tone process. Paper copy sizes shall be a maximum of 11 inches by 17 inches and a minimum of 4.25 inches by 5.5 inches. The machine shall have a halogen lamp light source and an automatic sheet feed (single cassette). Initially supply four reams (500 sheets per ream) of white copying paper and furnish a complete maintenance service contract/agreement for the machine.
- c. One personal computer, minimum 433 megahertz, 4 gigabyte hard drive, 64 megabyte of RAM, CD ROM Reader; 17" monitor (26 dot pitch maximum), mouse and keyboard. The software provided with the computer will be Microsoft "Windows 95" or better and Microsoft "Office Professional" or approved equivalent.
- d. One laser printer, HP 4000N or approved equivalent.

#### 2.2.7 Maintenance

The Contractor shall maintain the field office for the life of the contract. The Contractor shall be responsible for maintaining and paying for all costs associated with the following services:

- a. Supplies. Toilet paper, paper toweling, paper and supplies for the FAX and copy machines shall be provided. Supply water for the drinking water dispenser. Supply water for the lavatory if a service connection is not provided for potable water
- b. Maintenance of office equipment. Include a maintenance service contract/agreement for operation of the Fax and Copy machines
- c. Janitorial Service. The Contractor shall provide daily janitorial service and provide all janitorial and sanitary supplies as well as trash removal service.
- d. Snow removal. Maintenance of site access including snow removal service is the responsibility of the Contractor.
- e. Utilities. The Contractor is responsible for maintaining and paying all costs associated with utility services including water supply, sanitary waste system, electrical power and natural gas or oil service.

### PART 3 EXECUTION

#### 3.1 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site. Any dirt or mud which is tracked onto paved



or surfaced roadways shall be cleaned away. Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

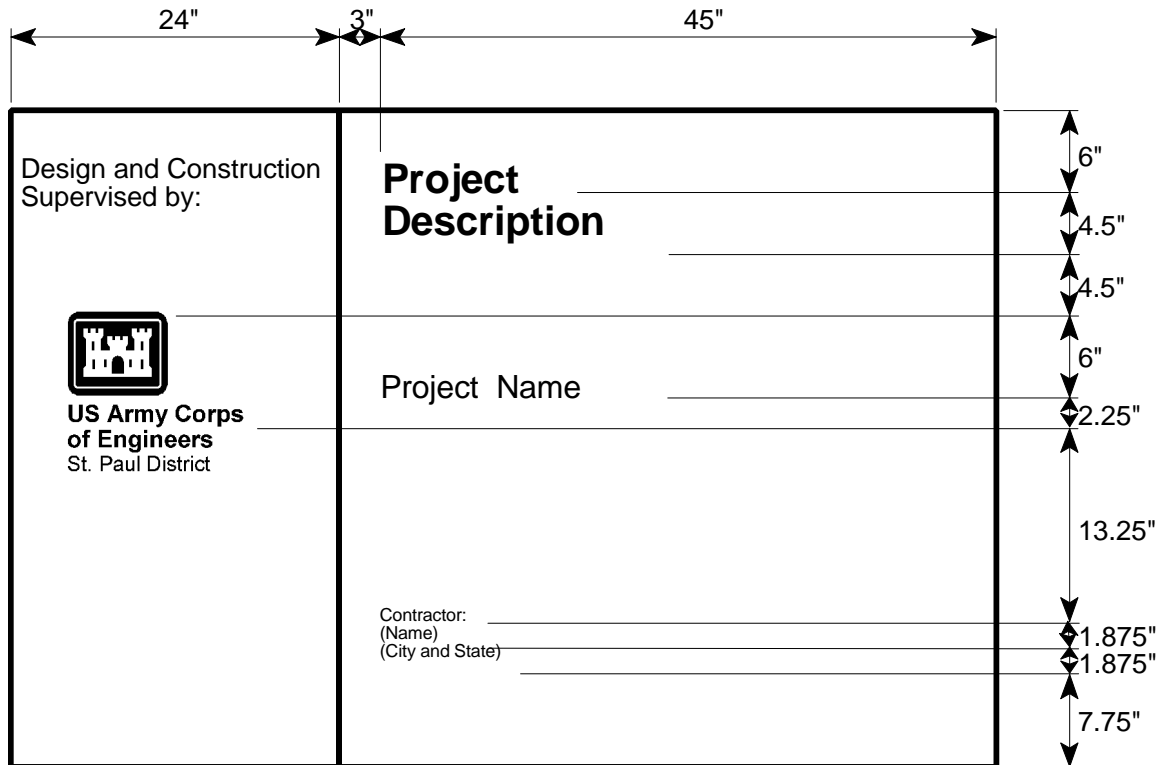
### 3.2 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

-- End of Section --

## PROJECT SIGN

The graphic format for this 4' x 6' sign panel follows the legend guidelines and layout as specified below. The large 4' x 4' section of the panel on the right is to be white with black legend. A 2' x 4' decal provided by the Corps shall be placed on the left side of the sign panel.



### Project Description:

One to three line project title legend describes the work being done under this contract.  
Color: Black; Typeface: 3" Helvetica Bold; Maximum line length: 42".

### Project Name:

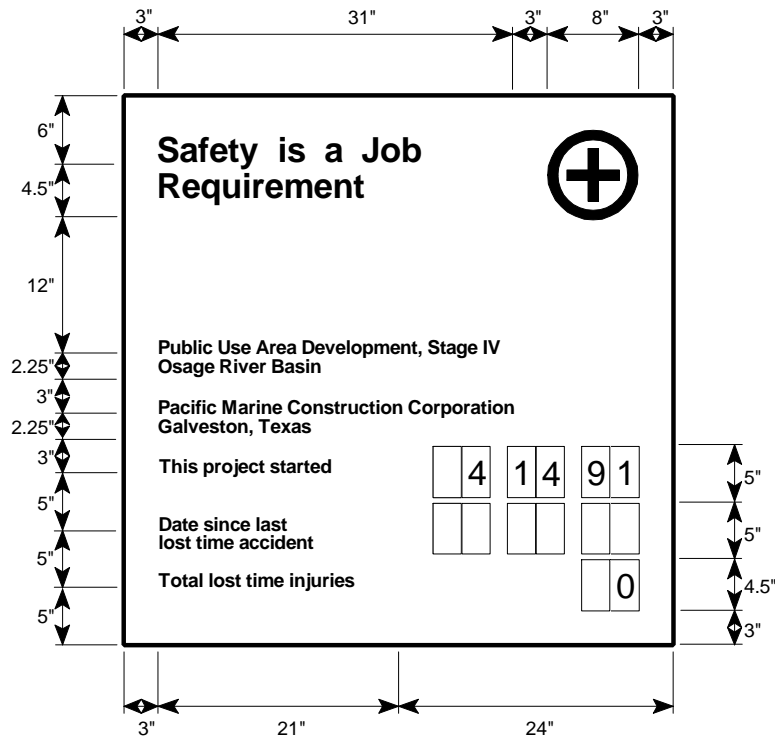
One to three line identification of project or facility.  
Color: Black; Typeface: 1.5" Helvetica Bold; Maximum line length: 42".  
Cross-align the first line of PROJECT NAME with the first line of the Corps Signature as shown.

### Contractor:

One to five line identification of prime contractors including: type (architect, general contractor, etc.), corporate or firm name, city, state.  
Color: Black; Typeface: 1.25" Helvetica Bold; Maximum line length: 21".

All typography is flush left and ragged right, upper and lower case with initial capitals only as shown. Letter and word spacing to follow Corps Standards (EP 310-1-6a and 6b).

## SAFETY SIGN



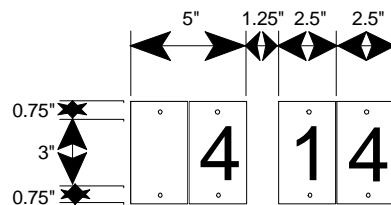
All typography is flush left and rag right, upper and lower case with initial capitals only as shown. Letter and word spacing to follow Corps Standards (EP 310-1-6a and 6b).

Legend Group 1: Standard two-line title "Safety is a Job Requirement" with (8" od.) Safety Green First Aid logo. Typeface: 3" Helvetica Bold; Color: Black.

Legend Group 2: One- to two-line project title legend describes the work being done under this contract and name of host project. Typeface: 1.5" Helvetica Regular; Color: Black; Maximum line length: 42".

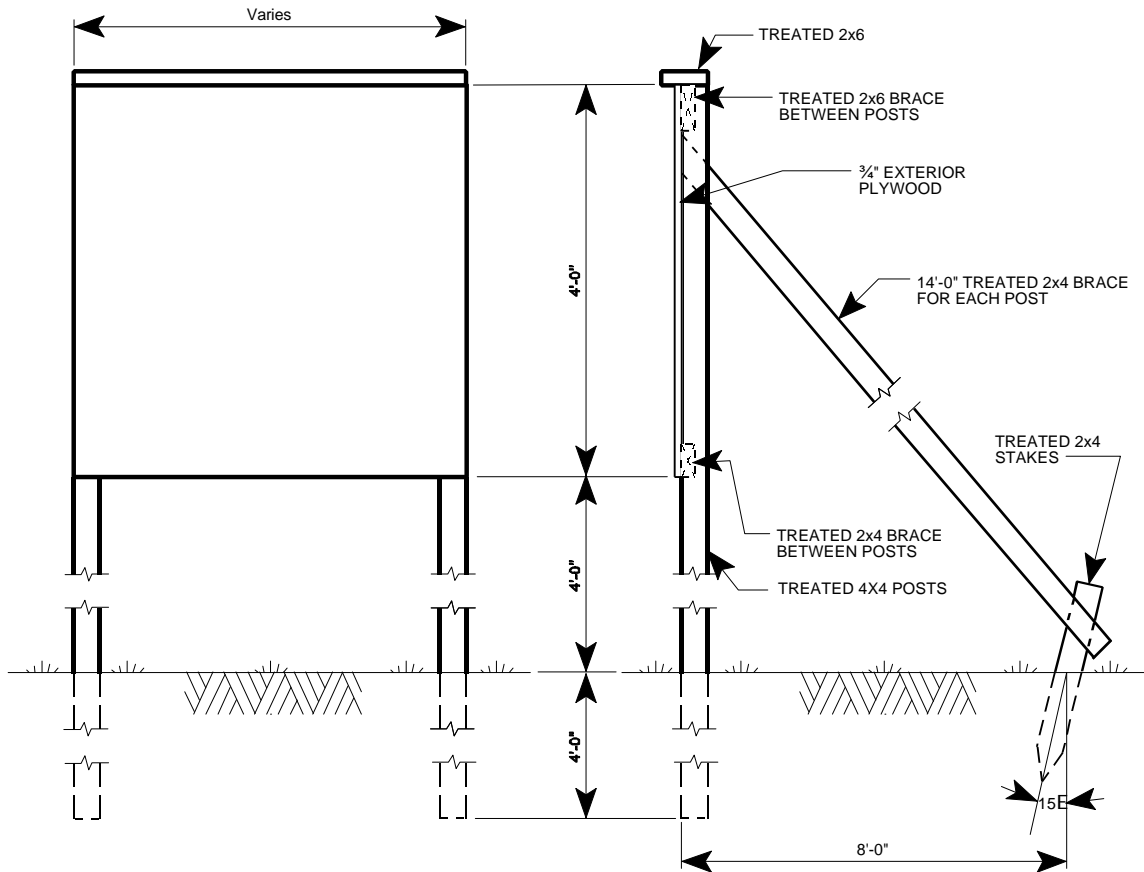
Legend Group 3: One- to two-line identification: name of prime contractor and city, state address. Typeface: 1.5" Helvetica Regular; Color: Black; Maximum line length: 42".

Legend Group 4: Standard safety record captions as shown. Typeface: 1.25" Helvetica Regular; Color: Black.



Replaceable numbers are to be mounted on white 0.060 aluminum plates and screw-mounted to background. Typeface: 3" Helvetica Regular; Color: Black; Plate size: 2.5" x 4.5".

## SIGN ERECTION DETAILS



SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01568

NORTH DAKOTA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PART 1 GENERAL

- 1.1 GENERAL
  - 1.1.1 Definitions
  - 1.1.2 Contract Drawings
- 1.2 REFERENCES
- 1.3 SUBMITTALS
- 1.4 PERMIT COMPLIANCE AND ADDITIONAL REQUIREMENTS
  - 1.4.1 Schedule
  - 1.4.2 Temporary Erosion And Sediment Control Plan
  - 1.4.3 Notice of Intent (NOI)
  - 1.4.4 Permanent Erosion And Sediment Control Plan
- 1.5 MEASUREMENT AND PAYMENT

PART 2 PRODUCTS

- 2.1 SILT FENCE
- 2.2 STRAW BALES
- 2.3 OTHER PRODUCTS

PART 3 EXECUTION

- 3.1 IMPLEMENTATION
- 3.2 MAINTENANCE
- 3.3 RECORDS
- 3.4 ATTACHMENTS

-- End of Section Table of Contents --

SECTION 01568

NORTH DAKOTA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PART 1 GENERAL

1.1 GENERAL

This section covers best management practices to be implemented for prevention of storm water pollution as required by the National Pollutant Discharge Elimination System (NPDES). The North Dakota Department of Health is responsible for administering permits for NPDES in the state of North Dakota. The Government has determined that the project work included under this contract requires NPDES permitting. The requirements herein supplement those covered in Section 01410 ENVIRONMENTAL PROTECTION.

1.1.1 Definitions

The following terms apply to this specification and the general permit, unless redefined in subsequent paragraphs:

- a. "Plan" means the Temporary Erosion and Sediment Control Plan.
- b. "EPA" means the United States Environmental Protection Agency.
- c. "Department" means the North Dakota Department of Health, Division of Water Quality.
- d. "NPDES" means the National Pollutant Discharge Elimination System.
- e. "NDPDES" means the North Dakota Pollutant Discharge Elimination System.
- f. "Owner" as referred to in the general permit shall mean the Federal Government.
- g. "Permittees" as referred to in the general permit shall mean the Federal Government and Contractor.
- h. "General Permit" means the general permit authorization to discharge storm water associated with a construction activity under the National Pollutant Discharge Elimination System/State Disposal System Permit Program.
- i. "BMP" means Best Management Practices.
- j. "NDDOH" means the North Dakota Department of Health.

1.1.2 Contract Drawings

The following features are shown on or can be determined from the contract drawings:

- a. The drainage patterns and approximate slopes anticipated after the

major grading activities.

- b. Areas of soil disturbance.
- c. The location(s) where stabilization practices are expected to occur.
- d. Typical details showing suggested Best Management Practices (BMPs) for erosion and sediment control.
- e. Waters of the State.
- f. Final site stabilization.

## 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

### ENVIRONMENTAL PROTECTION AGENCY (EPA)

|                  |   |
|------------------|---|
| EPA/832/R-92/005 | Storm Water Management for Construction<br>Activities - Developing Pollution<br>Prevention Plans and Best Management<br>Practices |
|------------------|---|

### NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

|           |  |
|-----------|--|
| NDDOT 856 | Standard Specifications for Road and<br>Bridge Construction (1997 Edition),<br>Erosion Control Blanket |
|-----------|--|

## 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-04 Drawings

Temporary Erosion And Sediment Control Plan; FIO.

A specific Temporary Erosion and Sediment Control Plan shall be submitted in accordance with paragraph PERMIT COMPLIANCE AND ADDITIONAL REQUIREMENTS.

### SD-18 Records

Notice of Intent (NOI); GA.

A copy of the NOI (NDDOH Form SFN 19145) shall be submitted to the Contracting Officer at the same time it is transmitted to the state.

Notice of Termination; FIO.

A copy of the notice of termination shall be submitted to the Contracting Officer at the same time it is transmitted to the state.

#### 1.4 PERMIT COMPLIANCE AND ADDITIONAL REQUIREMENTS

The Contractor shall comply with the requirements of Permit No. NDR03-0000. The following define additional requirements and clarify which requirements of the Permit are to be performed by either the Contractor, the Government, or both.

##### 1.4.1 Schedule

No contract project construction activities which requires an NPDES permit may commence until the NDPDES permit is valid.

##### 1.4.2 Temporary Erosion And Sediment Control Plan

The contract drawings show typical details of suggested best management practices (BMPs) for erosion and sediment control taken from EPA/832/R-92/005. The BMPs, together with applicable portions of the site drawings and specifications form an initial plan for temporary erosion and sediment control. The Contractor shall finalize and implement the plan. The finalized plan, together with documentation, shall be in accordance with the general permit NDR03-0000. The plan shall be maintained at the site and made available to federal, state, and local officials as requested. The Contractor shall determine the specific BMPs for erosion and sediment control (including the types, locations, and installation scheduling of erosion and sediment controls). These BMPs and corresponding material specifications and shop drawings shall be included in the Plan.

##### 1.4.3 Notice of Intent (NOI)

The NOI must be signed by the Government and the Contractor. A blank copy of the form (SFN 19145) is included at the end of this section. Immediately after contract award, the Contractor shall complete the form and plan, obtain signature by the Government, and submit the form with a copy of the Plan to the state. The NOI shall be post marked at least 30 days in advance of any ground breaking activities. The Contractor is responsible for payment of the application fee.

##### 1.4.4 Permanent Erosion And Sediment Control Plan

The Government has developed the Permanent Erosion and Sediment Control Plan and will maintain availability of the plan to federal, state, and local officials as required in the General Permit.

#### 1.5 MEASUREMENT AND PAYMENT

The Contractor shall be responsible for the work of this section, without any direct compensation being made other than the payment received for contract items.

## PART 2 PRODUCTS

### 2.1 SILT FENCE

Silt fence shall be manufactured and installed as shown on drawings. On level sites with minimal potential for sediment loading, the wire fabric may be omitted.

### 2.2 STRAW BALES



Straw shall be baled from oats, wheat, rye, barley, rice, or other coarse fiber vegetation that will percolate water. Hay baled from grass, alfalfa and clover is not acceptable.

### 2.3 OTHER PRODUCTS

Any products proposed for use that are not included on drawing shall be described fully, with catalog cuts and manufacturer's instructions for use, in the temporary erosion and sediment control plan. Other products, if proposed in the final plan, shall meet the following requirements:

Erosion control blankets shall meet NDDOT 856.

## PART 3 EXECUTION

As between the Government and the Contractor, the Contractor shall be responsible for fulfilling the obligations of the general permit for the following sections:

Part II-C: Stormwater Pollution Prevention Plan

Part III: Effluent Limitations, Monitoring, and Recording Requirements

### 3.1 IMPLEMENTATION

The Contractor shall install the sediment and erosion control system in accordance with the plan submitted to the Contracting Officer. The BMPs shall be modified if inspection indicates distress to the system or reveals unforeseen circumstances, or if directed by the Contracting Officer. Any updates to the plan shall be recorded. Permanent stabilization shall be initiated as soon as practicable in any portion of the site where construction activities are complete.

### 3.2 MAINTENANCE

The Contractor shall be responsible for implementing and managing the erosion and sediment control BMPs before and during the construction activities; and ensure that the Plan will be implemented and stay in effect until the work has been completed, the entire work site has undergone final stabilization, and a Notice of Termination has been submitted to the Contracting Officer and the state permitting authority.

### 3.3 RECORDS

The Contractor shall record on CQC reports: (1) dates when major stripping and grading activities occur, (2) dates when construction activities temporarily or permanently cease on a portion of the site, (3) when permanent stabilization practices are initiated, and (4) activities associated with inspection and maintenance.

### 3.4 ATTACHMENTS

NDPDES General Permit NDR03-0000 with Notice of Intent (NDDOH Form SFN 19145) and Appendices 27 Pages.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01572

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

PART 1 GENERAL

- 1.1 GENERAL
- 1.2 SUBMITTALS
- 1.3 MANAGEMENT
- 1.4 PLAN
- 1.5 RECORDS
- 1.6 COLLECTION
  - 1.6.1 Source Separated Method
  - 1.6.2 Co-Mingled Method
  - 1.6.3 Other Methods
- 1.7 DISPOSAL
  - 1.7.1 Reuse
  - 1.7.2 Recycle
  - 1.7.3 Waste

-- End of Section Table of Contents --

SECTION 01572

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

PART 1 GENERAL

1.1 GENERAL

Government policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy the Contractor shall: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-18 Records

Waste Management Plan; FIO.

A specific Waste Management Plan shall be submitted in accordance with paragraph PLAN.

1.3 MANAGEMENT

The Contractor shall take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort. Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work. In the management of waste consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling of waste. Revenues or other savings obtained for salvage, or recycling shall accrue to the Contractor. Firms and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by federal, state, and local regulations.

1.4 PLAN

A waste management plan shall be submitted within 15 days after contract award and prior to initiating any site preparation work. The plan shall include the following:

- a. Name of individuals on the Contractor's staff responsible for waste prevention and management.
- b. Actions that will be taken to reduce solid waste generation.
- c. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas and equipment to be used for processing, sorting, and temporary storage of wastes.
- d. Characterization, including estimated types and quantities, of the waste to be generated.
- e. Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.
- f. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used materials such as materials exchange networks and Habitat for Humanity.
- g. List of specific waste materials that will be salvaged for resale, salvaged and reused, or recycled. Recycling facilities that will be used shall be identified.
- h. Identification of materials that cannot be recycled/reused with an explanation or justification.
- i. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

#### 1.5 RECORDS

Records shall be maintained to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. The records shall be made available to the Contracting Officer during construction, and a copy of the records shall be delivered to the Contracting Officer upon completion of the construction.

#### 1.6 COLLECTION

The necessary containers, bins and storage areas to facilitate effective waste management shall be provided and shall be clearly and appropriately identified. Recyclable materials shall be handled to prevent contamination of materials from incompatible products and materials and separated by one of the following methods:

##### 1.6.1 Source Separated Method

Waste products and materials that are recyclable shall be separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing.

##### 1.6.2 Co-Mingled Method

Waste products and recyclable materials shall be placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed.

#### 1.6.3 Other Methods

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

### 1.7 DISPOSAL

Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:

#### 1.7.1 Reuse

First consideration shall be given to salvage for reuse since little or no re-processing is necessary for this method, and less pollution is created when items are reused in their original form. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project.

#### 1.7.2 Recycle

Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible.

#### 1.7.3 Waste

Materials with no practical use or economic benefit shall be disposed at a landfill or incinerator.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02220

DEMOLITION

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL REQUIREMENTS
- 1.3 SUBMITTALS
- 1.4 DUST CONTROL
- 1.5 PROTECTION
  - 1.5.1 Protection of Personnel
  - 1.5.2 Protection of Structures
  - 1.5.3 Protection of Existing Property
  - 1.5.4 Protection From the Weather
  - 1.5.5 Protection of Trees
  - 1.5.6 Protection of Utilities
  - 1.5.7 Environmental Protection
- 1.6 BURNING
- 1.7 USE OF EXPLOSIVES

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

- 3.1 EXISTING STRUCTURES
- 3.2 UTILITIES
  - 3.2.1 Utility Services
- 3.3 FILLING
- 3.4 DISPOSITION OF MATERIAL
  - 3.4.1 Salvageable Items and Material
    - 3.4.1.1 Material Salvaged for the Contractor
    - 3.4.1.2 Items Salvaged for Reuse
    - 3.4.1.3 Salvaged Granitoid Pavement
  - 3.4.2 Unsalvageable Material
- 3.5 CLEAN UP
- 3.6 PAVEMENTS

-- End of Section Table of Contents --

SECTION 02220

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ENGINEERING MANUALS (EM)

EM 385-1-1 (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible; salvaged items and materials shall be disposed of as specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-13 Certificates

Work Plan; GA

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

## 1.5 PROTECTION

### 1.5.1 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

### 1.5.2 Protection of Structures

Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, shall remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Contracting Officer. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

### 1.5.3 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

### 1.5.4 Protection From the Weather

Salvageable materials and equipment shall be protected from the weather at all times.

### 1.5.5 Protection of Trees

Trees within the project site which might be damaged during demolition, and which are indicated by the Contracting Officer to be left in place, shall be protected by a 6 foot high fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced in kind or as approved by the Contracting Officer.



#### 1.5.6 Protection of Utilities

Existing utilities and services to remain in service indicated on drawings shall be braced and/or restrained as required. Protect services and utilities to remain.

#### 1.5.7 Environmental Protection

The work shall comply with the requirements of Section 01410 ENVIRONMENTAL PROTECTION.

#### 1.6 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

#### 1.7 USE OF EXPLOSIVES

Use of explosives will not be permitted.

### PART 2 PRODUCTS (Not Applicable)

### PART 3 EXECUTION

#### 3.1 EXISTING STRUCTURES

Existing structures indicated on plans to be removed shall be removed. See the attached schedule of existing structures to be demolished. Interior walls, other than retaining walls and partitions, shall be removed to 10.0 feet below grade. Basement slabs, foundation, and miscellaneous debris from sites where home have previously been removed shall be removed as specified in Section 02300 EARTHWORK. Street and parking lot pavement and base courses, sidewalks, curbs, gutters, driveways, and street light bases shall be removed as indicated.

Abandoned storm sewers, sanitary sewers, water mains, and other utilities shall be plugged by filling with controlled density fill (CDF) or capped and removed as indicated or as approved by the Contracting Officer. The water main, storm and sanitary sewer plugs shall be inspected and approved by the City of Grand Forks Water Utility Department prior to backfilling.

#### 3.2 UTILITIES

Disconnection of utility services, with related meters and equipment, shall be performed by the respective utilities. Contact list for coordination of utility disconnections are included at the end of this section. Existing utilities shall be removed as indicated. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area.

##### 3.2.1 Utility Services

Utility services are not indicated on the drawings. Services have been abandoned from homes that have been removed; however, the services of homes have typically not been removed. The Contractor shall encounter utility services of homes that have been removed while performing the inspection trench. The Contractor shall be responsible for removal of utility services encountered within the inspection trench work limits.

### 3.3 FILLING

Holes, open basements and other hazardous openings shall be filled in accordance with Section 02300 EARTHWORK.

### 3.4 DISPOSITION OF MATERIAL

Title to material and equipment to be demolished, except Government salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

#### 3.4.1 Salvageable Items and Material

Contractor shall salvage items and material to the maximum extent possible.

##### 3.4.1.1 Material Salvaged for the Contractor

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from the project site before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

##### 3.4.1.2 Items Salvaged for Reuse

Salvaged items to be reused shall be removed in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage shall be repaired or replaced to match existing items. Containers shall be properly identified as to contents.

##### 3.4.1.3 Salvaged Granitoid Pavement

Removal of the granitoid pavement shall be coordinated with the Contracting Officer's Representative. The granitoid pavement shall be saw-cut into 4 foot by 4 foot sections (approximately 1600 pounds each). Viable sections shall be removed using adequate strapping. Salvaged sections shall be relocated to a storage area designated by the City of Grand Forks. All embedded manufacturer's bronze name plates in the removal areas shall be salvaged. The removal process shall be documented using photographs and videotape. The Contractor shall notify the Contracting Officer a minimum of 7 days prior to performing any pavement removal on Lewis Boulevard.

Place salvaged sections on wooden pallets and store at old Wastewater Department Yard located at N. 20th Street off of State Mill Road. Exact location of stored pallets within the yard to be determined by City prior to delivery. Support wooden pallets with gravel to avoid indentation in the ground.

#### 3.4.2 Unsalvageable Material

Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed off-site.

### 3.5 CLEAN UP

Debris and rubbish shall be removed from basement and similar excavations. Debris shall be removed and transported in a manner that prevents spillage

on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

### 3.6 PAVEMENTS

Existing pavements designated for removal shall be saw cut at limits of removal and removed.

-- End of Section --

## Attachment A

### Grand Forks Phase 1 Levees Utility Contact Summary 2/28/01

| Utility Company Name        | Utility Affected                    | Contact Person                 | Phone Number  |
|-----------------------------|-------------------------------------|--------------------------------|---|
| Qwest                       | Telephone                           | Greg Seaverson<br>Gary Hubbard | 701-241-3600<br>701-772-1056<br>218-779-6559 (Cell) |
| Xcel Energy                 | Gas and Electric                    | Deb Thompson                   | 701-795-5229<br>701-741-4429 (Cell)                 |
| NODAK Electric Cooperative  | Electric                            | Chuck Traiser                  | 701-746-4461<br>800-732-4373                        |
| Midcontinent Communications | Cable TV                            | James Poole                    | 701-746-1345<br>218-779-7672 (Cell)                 |
| City of Grand Forks         | Storm and Sanitary Sewers and Water | Gary Urness                    | 701-746-2649  |
| North Dakota One-Call       | Prior To Any Excavation             |                                | 800-795-0555  |

| Phase 2 levees, Grand Forks, ND, Demolition Schedule-Reach-1 |               |                             |  |  |
|--|---------------|-----------------------------|--|--|
| Approximate Station  | Side of Levee | Structure                   | Notes  |  |
| 150+80 to 151+85   | L             | Dirt Road                   |  |  |
| 151+20 to 151+50   | L             | Water Service Line          |  |  |
| 151+20 to 179+00   | C L & R       | Bike Trail                  | Asphalt Surface  |  |
| 151+20   | L             | 58" x 68" Brick Storm Sewer | Inv. El. 810.8' - Depth 14.5' - Plug and Abandon North-East End of Junction MH C1-1  |  |
| 151+40   | L             | 21" VCP Sanitary Sewer      | Inv. El. 800' - Depth 27' - Abandon  |  |
| 151+55 to 171+90   | L             | Street                      | N. 3rd Ave. - Remove 6" Concrete Pavement - Remove Curbs and Gutters on Both Sides of Street                                     |  |
| 151+55   | L             | Sidewalk                    | Concrete Surface   |  |
| 151+95   | L             | Sidewalk                    | Concrete Surface   |  |
| 151+90 to 152+30   | R             | Trees                       | Remove Minimum Necessary to Install 108" RCP Outfall Pipe  |  |
| 151+50 to 152+95   | R             | Sidewalk                    | Concrete Surface   |  |
| 151+50 to 156+10   | R             | Street                      | Lewis Boulevard - Salvage Granitoid Pavement for City - Remove 6" Concrete with 1-1/2" Asphalt Pavement                          |  |
| 151+50 to 154+10   | R             | Guardrail                   |  |  |
| 152+30   | L             | Catch Basin                 | Base Slab El. 825.5' - Depth 3.5' - Remove   |  |
| 152+30 to 152+40   | L             | 12" RCP Storm Sewer         | Inv. El. 826' - Depth 3' - Remove  |  |
| 152+40   | L             | Storm Sewer Manhole         | Base Slab El. 825' - Depth 5' - Remove - Remove and Replace NE 12" RCP from MH Out to Next Joint                                 |  |
| 152+40   | L             | Sidewalk                    | Concrete Surface   |  |
| 152+40 to 152+60   | L             | 12" RCP Storm Sewer         | Inv. El. 825.5' - Depth 4' - Remove  |  |
| 152+60   | L             | Catch Basin                 | Base Slab El. 826' - Depth 3.5' - Remove   |  |
| 152+95 to 155+15   | C L & R       | Basement Floor              | Remove a Minimum of 20' From Toe of Levee  |  |
| 153+10   | L             | Driveway                    | Concrete Surface   |  |
| 153+20   | R             | 48" RCP Storm Sewer         | Remove Outlet at River - See Note 4  |  |
| 153+70 to 155+60   | C L & R       | Sidewalk                    | Concrete Surface   |  |
| 153+80 to 155+65   | L             | Sidewalk                    | Concrete Surface   |  |
| 154+00   | L             | Driveway                    | Concrete Surface   |  |
| 154+40   | L             | Driveway                    | Concrete Surface   |  |
| 154+70   | L             | Sanitary Manhole            | Base Slab El. 801.5' - Depth 28.5' - Remove - Plug and Abandon 21" VCP at Outlets (2)  |  |
| 154+90   | R             | Storm Sewer Manhole         | Base Slab El. 806' +/- Depth 26' +/- Remove - Remove Concrete Slab and Sluice Gate - Plug and Abandon 48" and 72" RCP at Outlets |  |
| 154+90 to 155+30   | R             | Guardrail                   |  |  |
| 155+30   | L             | Driveway                    | Concrete Surface   |  |
| 155+30 to 175+20   | R             | Existing Levee              |  |  |
| 155+40   | L             | Catch Basin                 | Base Slab El. 825' - Depth 4' - Remove   |  |
| 155+40   | L             | 12" RCP Storm Sewer         | Inv. El. 825' - Depth 4.5' - Remove  |  |
| 155+40 to 156+15   | L             | 21" VCP Sanitary Sewer      | Base Slab El. 802' - Depth 26.5' - Remove for Construction of Drop Inlet C1-2  |  |
| 155+45   | L             | Storm Sewer Manhole         | Base Slab El. 824.5' - Depth 5.5' - Remove   |  |
| 155+45 to 155+60   | L             | 12" RCP Storm Sewer         | Inv. El. 825' - Depth 4' - Remove  |  |
| 155+50 to 155+95   | L             | 12" RCP Storm Sewer         | Inv. El. 824' - Depth 5' - Remove  |  |
| 155+60   | L             | Catch Basin                 | Base Slab El. 824.5' - Depth 4.5' - Remove   |  |
| 155+60   | L             | Catch Basin                 | Base Slab El. 826' - Depth 3.5' - Remove   |  |
| 155+60 to 155+95   | L             | 12" RCP Storm Sewer         | Inv. El. 824.5' - Depth 4.5' - Remove  |  |

| Phase 2 levees, Grand Forks, ND, Demolition Schedule-Reach-1 |               |                        |  |  |
|--|---------------|------------------------|--|--|
| Approximate Station  | Side of Levee | Structure              | Notes  |  |
| 155+70   | L             | Sanitary Manhole       | Base Sla. 823' - Depth 7' - Remove   |  |
| 155+75   | C L & R       | 72" RCP Storm Sewer    | Inv. El. 806' - Depth 18' - Remove Pipe from MH out to N-E for Construction of Drop Inlet C1-2. Plug and Fill Pipe Section Underneath Floodwall W/ CDF. Remove and Replace Pipe from MH out to S-W for Construction of Drop Inlet C1-2 |  |
| 155+85   | L             | Sidewalk               | Concrete Surface   |  |
| 155+95   | L             | Storm Sewer Manhole    | Base Slab El. 806' - Depth 23.5' - Remove  |  |
| 155+95 to 167+40   | L             | Sidewalk               | Concrete Surface   |  |
| 155+95 to 156+10   | L             | 12" RCP Storm Sewer    | Inv. El. 824' - Depth 5' - Remove  |  |
| 156-00 to 156+20   | L             | 12" RCP Storm Sewer    | Inv. El. 824.75' - Depth 3.5' - Remove   |  |
| 156+10   | L             | Storm Sewer Manhole    | Base Slab El. 824' - Depth 5.5' - Remove   |  |
| 156+10   | L             | Catch Basin            | Base Slab El. 824' - Depth 5.5' - Remove   |  |
| 156+10   | L             | Sidewalk               | Concrete Surface   |  |
| 156+10 to 159+70   | L             | 12" RCP Storm Sewer    | Inv. El. 823.5' to 819.5' - Depth 4' to 9' - Remove  |  |
| 156+15   | L             | Catch Basin            | Base Slab El. 825' - Depth 4' - Remove   |  |
| 156+70   | L             | Driveway               | Concrete Surface   |  |
| 157+45   | L             | Sanitary Manhole       | Base Slab El. 802' - Depth 28' - Remove  |  |
| 158+00   | L             | Driveway               | Concrete Surface   |  |
| 159+50   | L             | Driveway               | Concrete Surface   |  |
| 159+70   | L             | 2- Catch Basins        | Base Slab El. 824' - Depth 5' - Remove   |  |
| 159+70   | L             | 2-12" RCP Storm Sewers | Inv. El. 824' - Depth 4.5' - Remove  |  |
| 159+70   | L             | Storm Sewer Manhole    | Base Slab El. 823.5' - Depth 6' - Remove   |  |
| 159+70 to 160+20   | L             | 18" RCP Storm Sewer    | Inv. El. 824' to 822' - Depth 3.5' to 5.5' - Remove  |  |
| 160+00   | L             | Sidewalk               | Concrete Surface   |  |
| 160+20   | L             | Storm Sewer Manhole    | Base Slab El. 822' - Depth 7' - Remove - Remove and Replace 15" RCP out from S-W Outlet to Next Joint  |  |
| 160+50   | L             | Sidewalk               | Concrete Surface   |  |
| 160+60   | L             | Sanitary Manhole       | Base Slab El. 802.5' - Depth 27' - Remove  |  |
| 163+30   | L             | 2-Catch Basins         | Base Slab El. 823' - Depth 5' - Remove   |  |
| 163+30   | L             | 2-12" RCP Storm Sewers | Inv. El. 823.5' - Depth 4.5' - Remove  |  |
| 163+30   | L             | Storm Sewer Manhole    | Base Slab El. 823' - Depth 6' - Remove   |  |
| 163+30 to 164+20   | L             | 12" RCP Storm Sewer    | Inv. El. 822' - Depth 5.5' - Remove  |  |
| 163+60   | L             | Sidewalk               | Concrete Surface   |  |
| 163+75   | L             | Sanitary Manhole       | Base Slab El. 819' - Depth 10' - Remove  |  |
| 163+80   | L             | Sanitary Manhole       | Base Slab El. 803' - Depth 25.5' - Remove  |  |
| 164+10   | R             | 48" RCP Storm Sewer    | Remove Outlet at River - See Note 4  |  |
| 164+15   | R             | Storm Sewer Manhole    | Base Slab El. 811' - Depth 17' - Remove MH and Sluice Gate - Plug 48" RCP at N Outfall   |  |
| 164+15   | C L & R       | 48" RCP Storm Sewer    | Inv. El. 811.5' - Depth 12.5' - Plug and Fill with CDF   |  |
| 164+20   | L             | Storm Sewer Manhole    | Base Slab El. 811.5' - Depth 16.5'-Remove-Remove and Replace 48" RCP out from S-W Outlet out to Next Joint   |  |
| 164+20 to 164+50   | L             | 12" RCP Storm Sewer    | Inv. El. 822' - Depth 5' - Remove  |  |
| 164+30   | L             | Sidewalk               | Concrete Surface   |  |
| 164+50   | L             | Catch Basin            | Base Slab El. 822' - Depth 6.5' - Remove   |  |

| Phase 2 levees, Grand Forks, ND, Demolition Schedule-Reach-1 |               |                         |  |  |
|--|---------------|-------------------------|--|--|
| Approximate Station  | Side of Levee | Structure               | Notes  |  |
| 166+00   | L             | Driveway                | Concrete Surface   |  |
| 166+35 & 166+40  | L             | 2-Catch Basins          | Base Slab El. 822.5' - Depth 5.5' - Remove   |  |
| 166+35 to 166+40   | L             | 2-12" RCP Storm Sewers  | Inv. El. 823' - Depth 4.5' - Remove  |  |
| 166+45   | L             | Storm Sewer Manhole     | Base Slab El. 822.5' - Depth 6' - Remove   |  |
| 166+45 to 167+50   | L             | 12" RCP Storm Sewer     | Inv. El. 822.5' to 817.5' - Depth 5' to 10' - Remove   |  |
| 167+00   | L             | Driveway                | Concrete Surface   |  |
| 167+40   | L             | Sidewalk                | Concrete Surface   |  |
| 167+50   | C L & R       | 36" RCP Storm Sewer     | Inv. El. 815.5' - Depth 10.5' - Remove   |  |
| 167+45   | R             | Storm Sewer Manhole     | Base Slab. El. 800' - Depth 6.5' - Remove  |  |
| 167+50   | L             | Storm Sewer Manhole     | Base Slab. El. 815.5' - Depth 13.5' - Remove - Remove 36" RCP from SW Outlet out to Next Joint           |  |
| 167+50   | R             | 36" RCP Storm Sewer     | Remove Outlet at River - See Note 4  |  |
| 167+90 to 171+50   | L             | Sidewalk                | Concrete and Asphalt Surface   |  |
| 168+00   | L             | Sidewalk                | Concrete Surface   |  |
| 169+20   | L             | Driveway                | Concrete Surface   |  |
| 169+60   | L             | Catch Basin             | Base Slab El. 822.5' - Depth 5.5' - Remove   |  |
| 169+60   | L             | 12" RCP Storm Sewer     | Inv. El. 822.5' - Depth 4.5' - Remove  |  |
| 169+65   | L             | Catch Basin             | Base Slab El. 822.5' - Depth 5.5' - Remove   |  |
| 169+65   | L             | 12" RCP Storm Sewer     | Inv. El. 822.5' - Depth 5' - Remove  |  |
| 169+65   | L             | Storm Sewer Manhole     | Base Slab El. 822' - Depth 6.5' - Remove   |  |
| 169+65 to 171+50   | L             | 15" RCP Storm Sewer     | Inv. El. 821.5' - Depth 5.5' - Remove  |  |
| 169+70   | L             | Driveway                | Concrete Surface   |  |
| 170+00 to 172+00   | C L & R       | Parking Lot             | Remove Asphalt Surface and Concrete Curbs  |  |
| 170+30   | L             | Driveway                | Concrete Surface   |  |
| 170+35   | L             | Light Pole              | Remove and Replace   |  |
| 171+50   | L             | Storm Sewer Manhole     | Plug North-East Outlet - Remove and Replace 24" VCP from S-W Outlet Out to Next Joint                    |  |
| 171+50   | L             | 24" VCP Storm Sewer     | Inv. El. 812' to 810.5' - Depth 14' to 16.5' - Plug and Fill with CDF                                    |  |
| 171+55   | L             | Storm Sewer Manhole     | Base Slab. El. 810.5' - Depth 18.5' - Remove   |  |
| 171+55   | C L & R       | 24" VCP Storm Sewer     | Inv. El. 810.5' - Depth 18.5' - Plug and Fill with CDF   |  |
| 172+00   | R             | Storm Sewer Manhole     | Base Slab El. 804' - Depth 14' - Remove  |  |
| 172+25   | R             | 24" VCP Storm Sewer     | Remove Outlet at River - See Note 4  |  |
| 173+00   | L             | Concrete Slab           |  |  |
| 174+90 to 175+80   | C L & R       | Sidewalk and Ramp       | Remove Concrete Surface and Stairs   |  |
| 175+00 to 175+40   | L             | Parking Lot             | Remove Concrete Pavement and Curbs   |  |
| 175+30   | C & L         | Old Wood Piles          | Old Wood Piles From Previous Bridge No. 95 - Remove if Encountered Within Closure Structure or Floodwall |  |
| 175+30 to 179+30   | L             | Parking Lot             | Footprint  |  |
| 175+50 to 179+30   | C L & R       | Existing Levee          | Remove Concrete Surface and Curbs  |  |
| 175+60   | R             | Brick Retaining Wall    |  |  |
| 175+80   | C L & R       | 12" VCP Private Outfall | Remove Pipe Section Underneath Floodwall   |  |
| 176+20   | R             | Storm Sewer Manhole     | Remove   |  |

| Phase 2 levees, Grand Forks, ND, Demolition Schedule-Reach-1 |               |                            |   |
|--|---------------|----------------------------|---|
| Approximate Station  | Side of Levee | Structure                  | Notes   |
| 176+60   | R             | 12" VCP Private Outfall    | Remove Outlet at River - See Note 4   |
| 178+00   | L             | Storm Sewer Manhole        | Base Slab El. 809' - Depth 20' - Plug North Outlet (24")                                  |
| 178+15   | C L & R       | 24" RCP Private Outfall    | Inv. El. 809' - Depth 18' - Plug and Fill with CDF  |
| 178+30   | R             | Storm Sewer Manhole        | Base slab El. 807.5' - Depth 20.5' - Remove - Remove 24" RCP at River Outlet - See Note 4 |
| 178+40 & 179+30  | L             | Concrete Curb              | Remove Islands  |
| 179+30 to 179+80   | R             | Temp. Concrete Barrier     |   |
| 179+30   | R             | Concrete Curb and Sidewalk |   |
| 179+60   | C L & R       | 18" RCP Storm Sewer        | Inv. El. 821' - Depth 5.5' - Remove   |

Note:

- (1) Pipe locations, Invert elevations and depths are approximate and require field verification
- (2) Side of Levee:
  - C= Centered under proposed levee/closure structure
  - R= Riverside of proposed levee/closure structure
  - L= Landside of proposed levee/ Closure structure
- (3) Refer to Drawings for location of demolition and salvage features. In case of conflict between the Table, Drawings take precedence.
- (4) Remove a minimum of 20' of pipe at river outlet. Plug and abandon remaining pipe with concrete. Bury end with surrounding material.



|                     | Phase 2 levees, Grand Forks, ND, Demolition Schedule-Reach-2 |                |  |
|---------------------|--|----------------|--|
| Approximate Station | Side of Levee  | Structure      | Notes  |
| 224+15 to 224+50    | C L & R  | Sidewalk       | Concrete Surface                                     |
| 224+50 to 225+50    | R  | Existing Levee |  |
| 224+50 to 224+80    | C L & R  | Street         | River Street - Remove 6" Concrete Pavement and Curbs |
| 224+95              | R  | Sign           |  |
| 225+00 to 226+00    | R  | Trees          |  |
| 225+05 to 226+10    | C L & R  | Dirt Road      |  |
| 225+10 to 226+70    | R  | Trees          | See Note 4   |
| 225+80 to 226+00    | L  | Fence          |  |
| 226+00              | R  | Structure      | Remove Remaining Concrete Foundation                 |
| 226+15 to 228+00    | C L & R  | Trees          |  |
| 227+80 to 228+40    | C L & R  | Fence          |  |
| 228+10 to 232+70    | R  | Trees          | See Note 4   |
| 228+30 to 229+30    | R  | Trees          |  |
| 229+25              | C L & R  | Fence          |  |
| 230+00              | C L & R  | Structure      | Remove Remaining Concrete Foundation                 |
| 230+50              | R  | Structure      | Remove Remaining Concrete Foundation                 |
| 230+20 to 231+60    | L  | Driveway       | Remove and Replace Concrete Pavement                 |
| 231+60              | L  | Structure      | Remove Remaining Concrete Foundation                 |
| 232+00              | C L & R  | Structure      | Remove Remaining Concrete Foundation                 |
| 232+40 to 234+50    | C L & R  | Trees          |  |
| 232+70              | C L & R  | Fence          |  |
| 232+75 to 235+45    | C L & R  | Levee          |  |
| 234+00 to 236+60    | C L & R  | Fence          |  |
| 234+45              | R  | Sign           |  |
| 235+00              | L  | Trees          |  |

Note:

(1) Pipe locations, Invert elevations and depths are approximate and require field verification

(2) Side of Levee: C= Centered under proposed levee/closure structure

R= Riverside of proposed levee/closure structure

L= Landside of proposed levee/ Closure structure

(3) Refer to Drawings for location of demolition and salvage features. In case of conflict between the Table, Drawings take precedence.

(4) Tree removal for cylinder-pile wall: remove trees a maximum of 20' from cylinder piles on each side.

| Phase 2 levees, Grand Forks, ND, Demolition Schedule-Reach-3 |               |                          |   |  |
|--|---------------|--------------------------|---|--|
| Approximate Station  | Side of Levee | Structure                | Notes   |  |
| 254+80   | R             | Structure                | Intake Building - See Note 4  |  |
| 254+80 to 255+90   | R             | Trees                    |   |  |
| 254+80 to 258+20   | C L & R       | 18" Raw Water Intake     | Invert 800' to 829'- Depth 8' - See Note 4  |  |
| 255+30 to 255+90   | L             | Sidewalk                 | Concrete Surface  |  |
| 255+95 to 256+60   | R             | Trees                    |   |  |
| 255+75 to 256+60   | L             | Street                   | Lincoln Drive - Remove 6" Concrete Pavement and Curbs   |  |
| 255+95 to 256+30   | L             | Wood Fence               |   |  |
| 256+10   | C L & R       | Dirt Road                |   |  |
| 256+30   | R             | Structure                | Control Building - Salvage Equipment for City - See Note 4                                      |  |
| 256+30   | L             | Fire Hydrant             |   |  |
| 256+40 to 256+90   | L             | Trees                    |   |  |
| 256+70 to 258+70   | L             | Existing Levee           |   |  |
| 257+15 to 257+70   | C L & R       | Trees                    |   |  |
| 257+75   | R             | Light Pole               | Salvage for City  |  |
| 258+10 to 258+70   | C & R         | Playground               | Salvage Playground Components for City  |  |
| 258+50 to 270+80   | R             | Existing Levee           |   |  |
| 258+90 to 259+80   | L             | Existing Levee           |   |  |
| 258+95   | R             | Light Pole               | Salvage for City  |  |
| 259+10 to 260+10   | R             | Path                     | Concrete Surface  |  |
| 259+20 to 259+95   | R             | Trees                    |   |  |
| 259+30 to 259+70   | C & L         | Trees                    |   |  |
| 260+00 to 275+70   | L             | Existing Levee           |   |  |
| 261+35 to 261+70   | L             | Trees                    | Trees to be Removed Shall be Marked and Approved by Contracting Officer.                        |  |
| 261+60   | L             | Drinking Fountain        | Salvage for City  |  |
| 261+70 to 262+60   | C L & R       | Brick Retaining Wall     |   |  |
| 262+40 to 263+50   | C L & R       | Path                     | Concrete Surface  |  |
| 262+90 to 264+10   | L             | Trees                    | Trees to be Removed Shall be Marked and Approved by Contracting Officer.                        |  |
| 263+70 to 264+40   | R             | Trees                    |   |  |
| 265+00 to 270+10   | L             | Trees                    |   |  |
| 269+60 to 271+00   | C L & R       | 48" RCP Storm Sewer      | Inv. El. 808' to 798' - Depth 20' to 0' - Remove - Remove Outlet at River - See Note 4          |  |
| 269+70   | R             | Storm Sewer Manhole      | Base Slab El. 799' - Depth 16.5' - Remove MH, Concrete Slab, Sluice Gate, stand Pipe and Drains |  |
| 270+65 to 271+00   | R             | Trees                    |   |  |
| 270+70 to 278+20   | L             | Retaining Wall           |   |  |
| 270+80   | L             | Abandoned MH and Pipe    | Remove  |  |
| 270+95   | L             | Storm Sewer Manhole      | Base Slab El. 807.5' - Depth 9' - Remove  |  |
| 271+00 to 272+15   | R             | Trees                    | Remove Trees Down to River Bank to Allow Installation of New Outfall                            |  |
| 271+00   | L             | Storm Sewer Manhole      | Lower Manhole to El. 823.00'  |  |
| 271+00 to 271+25   | L             | Emergency Discharge Line | Salvage Valve and Check Valve, and Deliver to City  |  |

| Phase 2 levees, Grand Forks, ND, Demolition Schedule-Reach-3 |               |                        |  |
|--|---------------|------------------------|--|
| Approximate Station  | Side of Levee | Structure              | Notes  |
| 271+70 to 275+00   | C L & R       | Trees                  |  |
| 273+60 to 280+70   | L             | Path                   | Asphalt Surface  |
| 274+55 to 275+30   | L             | Trees                  | Trees to be Removed Shall be Marked and Approved by Contracting Officer.                       |
| 274+60 to 277+40   | C L & R       | Trees                  |  |
| 277+50 to 284+80   | L             | Trees                  |  |
| 278+15 to 283+40   | R             | Trees                  |  |
| 279+00 to 281+40   | L             | Trees                  | Trees to be Removed Shall be Marked and Approved by Contracting Officer.                       |
| 286+05 to 294+00   | C L & R       | Trees                  |  |
| 288+80   | L             | Storm Sewer Manhole    | Plug South Outlet (10" VCP) - Inv. El. 826.6' - Depth 5'                                       |
| 294+70 to 295+40   | L             | Trees                  |  |
| 295+30 to 304+00   | L             | Existing Levee         |  |
| 297+10   | L             | 10" VCP Storm Sewer    | Inv. El. 814.0' - Depth 21.5' - Remove Pipe Out to Next Joint and Plug                         |
| 297+10   | L             | 2-48" RCP Storm Sewers | Inv. El. 814.0' - Depth 19' - Remove Pipes from MH Out to Next Joint and Plug                  |
| 297+10   | L             | Storm Sewer Manhole    | Base Slab El. 814.0' - Depth 23' - Remove  |
| 298+25 to 299+40   | L             | Trees                  |  |
| 299+00   | L             | Storm Sewer Manhole    | Lower Manhole to El. 834.00'   |
| 300+50 to 303+20   | C L & R       | Trees                  |  |
| 301+70 to 303+40   | C L & R       | Fence                  |  |
| 301+75 to 302+85   | C L & R       | Structure              | Remove Remaining Concrete Foundation   |
| 301+90 to 302+70   | R             | Concrete Pavement      |  |
| 303+40   | L             | Parking Lot            | Remove Concrete Pavement - Protect Remaining Parking Lot                                       |
| 303+50 to 303+80   | C L & R       | Fence                  |  |
| 303+95 to 304+25   | C L & R       | Street                 | Elks Drive - Remove 6" Concrete Pavement and Curbs   |
| 304+15   | C L & R       | 54" RCP Storm Sewer    | Inv. El. 811.5' - Depth 16.5' - Plug and Fill with CDF Under Closure Structure                 |
| 304+15   | L             | 54" RCP Storm Sewer    | Inv. El. 813.2' - Depth 20.5' - Remove 54" RCP at NE Outlet From MH Out to Next Joint and Plug |
| 304+15   | L             | Street                 | Elks Drive - Remove 6" Concrete Pavement   |

Note:

- (1) Pipe locations, Invert elevations and depths are approximate and require field verification
- (2) Side of Levee: C= Centered under proposed levee/closure structure  
R= Riverside of proposed levee/closure structure  
L= Landside of proposed levee/ Closure structure
- (3) Refer to Drawings for location of demolition and salvage features. In case of conflict between the Table, Drawings take precedence.
- (4) The City's water intake, water intake building, pump electrical leads and control building shall be maintained in service until May 1, 2004. If line between intake and control buildings is removed prior to this date, it must be replaced with a temporary 18" diameter line until May 1, 2004. City to be notified a minimum of two (2) weeks prior to demolition to allow for salvage of equipment in control building. Temporary line shall be plugged once out of service. Temporary line shall be plugged once out of service. Discharge from intake building shall be plugged 5' from building as line will be reused.
- (5) Remove a minimum of 20' of pipe at river outlet. Plug and abandon remaining pipe with concrete. Bury end with surrounding material.

| Phase 2 levees, Grand Forks, ND, Demolition Schedule-Reach-4 |               |                                      |  |  |
|--|---------------|--------------------------------------|--|--|
| Approximate Station  | Side of Levee | Structure                            | Notes  |  |
| 355+00 to 357+55   | C L & R       | Trees                                |  |  |
| 357+25 to 357+70   | L             | Fence                                |  |  |
| 357+50 to 358+30   | C L & R       | 2" Xcel Energy Polyethylene Gas Line |  |  |
| 357+50 to 362+70   | R             | Emergency Levee                      |  |  |
| 358+10 to 359+10   | C L & R       | Street                               | Hughes Court - Remove 6" Concrete Pavement and Curbs   |  |
| 360+00 to 361+25   | C L & R       | Trees                                |  |  |
| 361+40 to 362+65   | R             | Trees                                |  |  |
| 362+90   | L             | Catch Basin                          | Inv. El. 828' - Depth 5' - Plug South Outlet   |  |
| 362+90 to 363+15   | L             | 12" RCP Storm Sewer                  | Inv. El. 828.0' - Depth 3.5' - Remove  |  |
| 362+90 to 364+00   | C L & R       | Street                               | Belmont Court - Remove 6" Concrete Pavement and Curb   |  |
| 363+10   | C L & R       | 2" Xcel Energy Polyethylene Gas Line | Remove and Cap West End  |  |
| 363+15 to 364+70   | L             | Sidewalk                             | Concrete   |  |
| 363+30 to 363+90   | L             | 27" RCP Storm Sewer                  | Inv. El. 821' - Depth 10' - Remove Pipe from MH out to Next Joint North of New 108" RCP for Connection |  |
| 363+40 to 364+00   | L             | 12" PVC Watermain                    | Remove - Abandon Remaining Pipe  |  |
| 363+70 to 364+35   | L             | Street                               | Belmont Road - Remove and Replace 6" Concrete Pavement and Curbs                                       |  |
| 363+60 to 364+00   | R             | Trees                                | Remove Trees Down to River Bank to Allow Installation of New 108" RCP Outfall                          |  |
| 363+80   | L             | Light Pole                           | Remove and Replace   |  |
| 363+80   | L             | Electrical Box                       |  |  |
| 363+95   | L             | Storm Sewer Manhole                  | Base Slab El. 821' - Depth 12.5' - Remove  |  |
| 364+80   | L             | 12" PVC Storm Sewer                  | Plug Inlet with Concrete and Fill Pipe with CDF  |  |
| 364+85   | L             | Storm Sewer Manhole                  | Base Slab El. 820' - Depth 10' - Remove  |  |
| 365+00   | L             | 12" PVC Storm Sewer                  | Remove and Salvage Flap Gate for City - Plug Outlet with Concrete                                      |  |
| 365+00   | L             | 84" RCP Storm Sewer                  | Plug Inlet with Concrete - Fill Pipe with CDF  |  |
| 365+15   | L             | Electrical Box                       |  |  |
| 365+15   | L             | 84" RCP Storm Sewer                  | Remove and Salvage Flap Gate for City - Remove Concrete Head Wall - Plug Outlet with Concrete          |  |
| 365+40   | L             | 2-42" RCP Storm Sewer                | Remove Grates - Plug Inlet with Concrete - Fill Pipes with CDF   |  |
| 365+40   | L             | 2-42" RCP Storm Sewer                | Remove and Salvage Flap Gate for City - Remove Concrete Head Wall - Plug Outlet with Concrete          |  |
| 365+40   | L             | Driveway                             | Concrete Pavement  |  |
| 365+40   | L             | Pump Station                         | Salvage Pumps, Controller and Trash Rack for City  |  |
| 365+65   | L             | 24" RCP Storm Sewer                  | Inv. El. 822' - Depth 10' - Plug Outlet with Concrete - Fill Pipe with CDF                             |  |
| 365+70   | L             | 60" RCP Storm Sewer                  | Remove and Salvage Flap Gate for City - Plug Outlet with Concrete - Fill Pipe with CDF                 |  |
| 366+00   | L             | Storm Sewer Manhole                  | Base Slab El. 822' - Depth 12' - Plug North and Northwest Outlets (15" RCP)                            |  |
| 366+20 to 366+40   | C L & R       | Trees                                |  |  |
| 366+40 to 367+50   | R             | Trees                                |  |  |
| 367+15 to 368+25   | L             | Emergency Levee                      |  |  |
| 367+30 to 368+00   | C L & R       | Trees                                |  |  |

| Phase 2 levees, Grand Forks, ND, Demolition Schedule-Reach-4 |               |                         |  |
|--|---------------|-------------------------|--|
| Approximate Station  | Side of Levee | Structure               | Notes  |
| 368+30 to 369+50   | L             | Emergency Levee         |  |
| 368+50 to 372+10   | C & R         | Trees                   |  |
| 369+10 to 372+70   | C L & R       | Trail                   | Concrete Surface   |
| 369+25 to 370+30   | L             | Trees                   |  |
| 370+30 to 371+10   | L             | 2- Rock Retaining Walls | Remove Walls and Tie-Backs   |
| 370+65 to 371+30   | L             | Trees                   |  |
| 380+50 to 383+30   | L             | Emergency Levee         |  |
| 382+25   | L             | 15" RCP Storm Sewer     | Inv. El. 822' - Depth +/-7' - Remove                                 |
| 384+60 to 386+60   | L             | Emergency Levee         |  |
| 385+40   | L             | 15" RCP Storm Sewer     | Inv. El. 826' - Depth +/-6.5' - Remove                               |
| 388+55 to 388+70   | C L & R       | 15" RCP Storm Sewer     | Inv. El. 826' to 817' - Depth 0' to 7' - Remove                      |
| 388+55   | L             | Storm Sewer Manhole     | Base Slab El. 817' - Depth 10.5' - Remove                            |
| 388+70   | L             | Storm Sewer Manhole     | Base Slab El. 815' - Depth 5.5' - Remove                             |
| 388+70   | R             | Storm Sewer Manhole     | Base Slab El. 808' - Depth 8' - Remove                               |
| 388+70+  | R             | 15" RCP Storm Sewer     | Remove Outlet at River - See Note 4                                  |
| 394+70 to 395+50   | C L & R       | Emergency Levee         |  |
| 394+90 to 401+15   | R             | Trees                   |  |
| 395+75 to 397+30   | R             | Emergency Levee         |  |
| 396+60   | L             | Light Pole              | Remove and Replace   |
| 398+00 to 400+00   | R             | Emergency Levee         |  |
| 399+00   | L             | Light Pole              | Remove and Replace   |
| 401+00   | L             | Light Pole              | Remove and Replace   |
| 401+40 to 411+40   | R             | Emergency Levee         |  |
| 402+20 to 409+80   | R             | Trees                   |  |
| 407+95   | L             | Storm Sewer Manhole     | Base Slab at El. 826' - Depth 8.5'                                   |
| 407+95   | C & R         | 15" RCP Storm Sewer     | Inv. El. 826' - Depth 7' - Remove                                    |
| 408+00 to 408+40   | L             | 15" RCP Storm Sewer     | Inv. El. 826' - Depth 0' to 7' - Plug and Fill with CDF - Plug Inlet |
| 408+50 to 408+80   | L             | Concrete Gutter         |  |
| 408+90   | L             | Fence                   | Remove and Replace   |
| 409+40   | L             | 12" RCP Storm Sewer     | Remove Outlet and Pipe from MH out to Next Joint                     |
| 410+50 to 411+30   | L             | Fence                   | Remove and Replace   |

Note:

- (1) Pipe locations, Invert elevations and depths are approximate and require field verification
- (2) Side of Levee:
  - C= Centered under proposed levee/closure structure
  - R= Riverside of proposed levee/closure structure
  - L= Landside of proposed levee/ Closure structure
- (3) Refer to Drawings for location of demolition and salvage features. In case of conflict between the Table, Drawings take precedence.
- (4) Remove a minimum of 20' of pipe at river outlet. Plug and abandon remaining pipe with concrete. Bury end with surrounding material.

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02230

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Clearing

1.1.2 Grubbing

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

3.2 GRUBBING

3.3 TREE REMOVAL

3.4 DISPOSAL OF MATERIALS

3.4.1 Materials Other Than Salable Timber

3.5 ACCEPTANCE

-- End of Section Table of Contents --

SECTION 02230

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Clearing

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared. Clearing operations shall be conducted in areas designated on the drawings.

1.1.2 Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Grubbing operations shall be done in areas for structures and areas to receive levee fill or to be paved as shown on the drawings.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.2 GRUBBING

Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 24 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for levees, buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

### 3.4 DISPOSAL OF MATERIALS

#### 3.4.1 Materials Other Than Salable Timber

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of offsite, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

### 3.5 ACCEPTANCE

Upon completion of the site clearing, obtain the Contracting Officer's acceptance of the extent of clearing and grubbing.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02300

EARTHWORK

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 SUBSURFACE DATA
- 1.4 ALTERNATE BORROW SOURCES AND EVALUATION
  - 1.4.1 Alternate Sources

PART 2 PRODUCTS

- 2.1 DEFINITIONS
  - 2.1.1 Satisfactory Materials
  - 2.1.2 Cohesionless and Cohesive Materials
  - 2.1.3 Proctor
- 2.2 MATERIALS
  - 2.2.1 Common Borrow
  - 2.2.2 Select Granular Fill
  - 2.2.3 Granular Fill
  - 2.2.4 Impervious Fill
  - 2.2.5 Select Impervious Fill
  - 2.2.6 Random Fill
- 2.3 CONSTRUCTION EQUIPMENT
  - 2.3.1 Levees

PART 3 EXECUTION

- 3.1 CLASSIFICATION OF SOIL MATERIALS
- 3.2 STOCKPILES
- 3.3 STRIPPING OF TOPSOIL
- 3.4 EXCAVATION
  - 3.4.1 Changes and Differing Site Conditions
- 3.5 DITCHES AND GUTTERS
- 3.6 BORROW MATERIAL
  - 3.6.1 Excavation and Borrow Pits
  - 3.6.2 Utilization of Excavated Materials
- 3.7 FILLS AND EMBANKMENTS
- 3.8 STRUCTURES
- 3.9 LEVEES
  - 3.9.1 Inspection Trench
- 3.10 SUBGRADE PREPARATION
  - 3.10.1 Subgrade Correction
- 3.11 FINISHING
  - 3.11.1 Pavement Subgrade Tolerances
- 3.12 PLACING TOPSOIL
- 3.13 COMPACTION
  - 3.13.1 Moisture Control
  - 3.13.2 Placement And Compaction
- 3.14 TESTING

Grand Forks Phase 2 Levees

- 3.14.1 General
- 3.14.2 Field Density Tests
- 3.14.3 Proctor Tests
- 3.14.4 Treatment of Oversize Particles for Density Tests
- 3.14.5 Corrective Action
- 3.14.6 Testing Schedule
- 3.15 NUCLEAR DENSITY TESTING EQUIPMENT
- 3.16 SUBGRADE AND EMBANKMENT PROTECTION

-- End of Section Table of Contents --

SECTION 02300

EARTHWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |  |
|-------------|--|
| ASTM C 117  | (1995) Materials Finer Than 75 Micrometers (No. 200 Sieve) in Mineral Aggregates by Washing                          |
| ASTM C 136  | (1996a) Sieve Analysis of Fine and Coarse Aggregates   |
| ASTM D 422  | (1963; R 1998) Particle Size Analysis of Soils   |
| ASTM D 698  | (1998) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.)) |
| ASTM D 1556 | (1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method  |
| ASTM D 2487 | (1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)                         |
| ASTM D 2488 | (1993) Description and Identification of Soils   |
| ASTM D 2922 | (1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)                              |
| ASTM D 3017 | (1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)                          |
| ASTM D 4318 | (1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils  |
| ASTM D 4718 | (1987; R 1994) Correction of Unit Weight and Water Content for Soils Containing Oversize Particles                   |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Testing; FIO

A summary of testing results indicated in PARAGRAPH: TESTING shall be submitted when the site work is substantially complete. The Contracting Officer shall be informed of test results daily for direction on corrective action required. Draft copies of field testing results shall be furnished to the Contracting Officer on a frequent and regular basis as directed, but do not need to be formally transmitted through the submittal process.

Daily Report Forms; FIO

A compilation of the daily report forms for earthwork observation and inspection trench observations ordered by date shall be submitted when the work is substantially complete. Preliminary copies shall be furnished to the Contracting Officer on a weekly or monthly basis as directed, but do not need to be formally transmitted through the submittal process.

1.3 SUBSURFACE DATA

Reference the Physical Data clause in Section 00800.

1.4 ALTERNATE BORROW SOURCES AND EVALUATION

Borrow materials shall be produced from the sources shown on drawings or listed in Section 00830 ATTACHMENTS. If Contractor proposes to furnish borrow from a source not shown or listed, Government approval of the source is required. The Government will make such investigations and evaluations as necessary to determine whether or not materials with acceptable characteristics can be obtained from the proposed source. Approval (or rejection) will require at least 30 days, but not more than 120 days. Borrow areas which involve the excavation of wetlands or wooded areas will not be approved.

1.4.1 Alternate Sources

a. Evaluation by Site Inspection. If the Contractor proposes to furnish borrow from an unlisted source, the Government will evaluate the alternate source. An investigation shall be performed by a Government geologist or engineer. The Contractor shall expose fresh soil for the full height of the face proposed for production during the field evaluation.

b. Evaluation by Test Data. If sufficient information is not available, the Government will reconsider the alternate source if evaluation is supplemented by sampling and testing of the properties specified for the material. If the Contractor wishes to pursue the alternate source, the Government will notify the Contractor of required sampling and number of tests required. The Contractor shall be responsible for sampling and testing costs for alternate sources. The Contracting Officer shall be present during the sampling, unless waived. Information provided with the

samples shall include the location and elevation from which the sample was taken. Testing shall be completed by a laboratory approved in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Test results and jar samples shall be furnished to the Government geologist at the District Office. This will require a 14 day evaluation period after the test results are received at the District Office.

## PART 2 PRODUCTS

### 2.1 DEFINITIONS

#### 2.1.1 Satisfactory Materials

Satisfactory materials shall be of a character and quality satisfactory for the purpose intended, and meet the applicable material specifications.

#### 2.1.2 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

#### 2.1.3 Proctor

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698. The maximum density is hereafter abbreviated as the "Standard Proctor" or "Proctor" value. The optimum moisture content,  $W_o$ , is the water content at which the soil is compacted to the maximum density as determined during the test procedure presented in ASTM D 698.

### 2.2 MATERIALS

All material placed as fill or backfill shall consist of material classified by ASTM D 2487 as GW, GP, GC, GM, SP, SM, SC, CL, CH AND SW. The material shall be free of ice, snow, frozen earth, trash, debris, sod, roots, organic matter, or stones larger than 3 inches in any dimension.

#### 2.2.1 Common Borrow

Common borrow shall have less than 40 percent retained on the No. 4 sieve, and less than 30 percent retained on the 3/4 inch sieve.

#### 2.2.2 Select Granular Fill

Select granular material shall meet requirements for common borrow and shall contain not more than 5 percent by weight of material passing the No. 200 sieve. The maximum allowable aggregate size shall be 1-1/2 inches.

#### 2.2.3 Granular Fill

Granular material shall meet requirements for common borrow and shall contain not more than 12 percent by weight of material passing the No. 200 sieve.

#### 2.2.4 Impervious Fill

Impervious fill shall meet requirements for common borrow and shall have a

plasticity index less than 50 and classified by ASTM D 2487 as CL or CH.

#### 2.2.5 Select Impervious Fill

Select impervious fill shall meet requirements for common borrow, shall have a plasticity index less than 30, and a clay fraction less than 40 percent by weight finer than 0.002 mm and classified by ASTM D 2487 as CL or CH.

#### 2.2.6 Random Fill

Random fill shall consist of native materials meeting the requirements for common borrow.

### 2.3 CONSTRUCTION EQUIPMENT

Compaction equipment shall consist of sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil type being compacted. Water flooding or jetting methods of compaction will not be permitted for any soil types. Sprinkling equipment for cohesive soils shall apply water uniformly, in controlled quantities, and be capable of variable application widths.

#### 2.3.1 Levees

Use of sheepsfoot rollers (vibratory or non-vibratory), or scarification between lifts, is required for construction of levees (any water retaining structures). Construction equipment and methods shall avoid poor bonding between lifts, characterized by layered or laminated texture at the lift interfaces. Smooth surfaces (such as produced from smooth drum rollers, rubber tired rollers, and construction traffic) shall be scarified prior to placing subsequent lifts.

## PART 3 EXECUTION

### 3.1 CLASSIFICATION OF SOIL MATERIALS

Classification of soil materials shall be performed by the Contractor in accordance with ASTM D 2488. The Contracting Officer reserves the right to revise the Contractor classifications. In the case of disagreement, the Contracting Officer's classification will govern unless the soils are classified in accordance with ASTM D 2487. All testing completed by the Contractor in conjunction with soil material classification will be considered incidental to the contract work.

### 3.2 STOCKPILES

Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed. Satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes contaminated, frozen or too wet for use, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government. No material shall be stockpiled riverward of the

flood barrier and/or higher than the floor barrier without approval of the Contracting Officer.

### 3.3 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 6 inches. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be removed from the site.

### 3.4 EXCAVATION

After topsoil removal has been completed, excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades indicated. Excavation material suitable for use as fill shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material, including any soil which is disturbed by the Contractor's operations or softened due to exposure to the elements and water, and surplus material shall be disposed of in areas approved for off site storage. Excavations carried below the depths indicated shall be refilled to the proper grade with satisfactory material. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

#### 3.4.1 Changes and Differing Site Conditions

Any excavation subgrades that are unstable, pump, rut excessively, reveal soil conditions that are substantially different from that indicated in the contract, or are unsuitable for proceeding with the work shall immediately be reported to the Contracting Officer. In the event that it is necessary to remove material to a depth greater than specified, the Contracting Officer will provide direction for changed work; and an adjustment in the contract price will be considered in accordance with the contract. Unsatisfactory material encountered below the grades shown shall be removed as directed. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer. The Contracting Officer shall be notified prior to proceeding with any unauthorized work. Additional work not authorized by the Contracting Officer shall be at the Contractor's expense.

### 3.5 DITCHES AND GUTTERS

Ditches and gutters shall be cut accurately to the cross sections and grades indicated. Gutters and ditches shall be finished in a manner that will result in effective drainage. All roots, stumps, rock, and foreign matter in the sides and bottom of ditches and gutters shall be trimmed and dressed or removed to conform to the slope, grade, and shape of the section indicated. Care shall be taken not to excavate ditches and gutters below the grades indicated. Excessive ditch and gutter excavation shall be

backfilled to grade with properly placed and compacted material. All ditches and gutters excavated under this section shall be maintained until final acceptance of the work. Satisfactory material excavated from ditches and gutters shall be placed in fill areas.

### 3.6 BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas shown or from other approved sources, either private or within the limits of the project site, selected by the Contractor. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and drainage of borrow pits and the disposal of debris thereon and restoration shall be considered related operations to the borrow excavation.

#### 3.6.1 Excavation and Borrow Pits

Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of, or used for special purposes. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

#### 3.6.2 Utilization of Excavated Materials

Material removed from excavations shall be incorporated in the work insofar as practicable. No excavated material that is satisfactory for use as fill shall be wasted without specific written authorization. Material authorized to be wasted shall be stored in designated areas approved for surplus material storage and disposed of offsite. No excavated material shall be disposed of in such a manner as to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

### 3.7 FILLS AND EMBANKMENTS

Fills and embankments shall be constructed at the locations and to lines and grades indicated. Fill shall meet the material specifications for the zones indicated on the drawings. The material shall be placed in successive horizontal layers for the full width of the cross section and shall be compacted as specified. Each layer shall be compacted before the overlaying lift is placed.

### 3.8 STRUCTURES

Excavation and backfilling for structures is specified in Section 02315 EXCAVATION, FILLING, AND BACKFILLING FOR STRUCTURES.



### 3.9 LEVEES

#### 3.9.1 Inspection Trench

The inspection trench will be used to locate undesirable subsurface features. Any pipes, tiles, conduits, buried debris, or other unsatisfactory foundation materials encountered shall be removed from within the footprint of the levee or plugged as directed by the Contracting Officer. The Contractor shall notify the Contracting Officer 48 hours prior to start of this work. Observations shall be recorded on the daily report forms attached to this specification, or to a Contractor's special purpose form for observing trench excavations if approved by the Contracting Officer

a. Inspection Trench Excavation and Observation. An inspection trench will be excavated as shown on the drawings. Immediately after excavating the trench, the Contractor shall inspect and record the soil and water conditions encountered and any other pertinent features. Soils on the base and side slopes shall be identified in accordance with ASTM D 2488. In reaches where caving occurs, the Contractor shall either widen the trench, dewater to keep the trench stable, or assign a competent person to observe the excavation continuously in addition to the excavator operator. Excessive water seepage shall be removed to allow visual inspection. During construction of the inspection trench, the Contractor shall immediately notify the Contracting Officer in the event that soil conditions encountered differ significantly from those shown on the boring logs.

b. Inspection Trench Backfill. The Contracting Officer will observe the trench before backfilling, unless waived for trench stability reasons. All water and mud shall be removed from the trench before backfill is placed. The excavated material may be used for backfill only if it meets the material specified. All inspection trench backfill shall be placed in lifts and compacted as specified in paragraph COMPACTION.

c. Inspection Trench Location. The inspection trench shall generally be located close to the levee centerline. The inspection trench shall be continuous at all points, aligned with smooth curves, and free from abrupt changes in alignment. The Contracting Officer may direct the actual alignment of the inspection trench within the limits of the levee right of way to intercept suspect areas.

#### 3.10 SUBGRADE PREPARATION

All areas upon which fill is to be placed shall be stripped before the fill is started. Material shall not be placed on surfaces that are muddy, frozen, contain frost, or where unsatisfactory material remains in or under the fill. For cohesionless soils, the subgrade surface shall be compacted to at least 100 percent of the Standard Proctor density. For cohesive soils, the subgrade shall be proof rolled with rubber tired equipment and any soft areas shall be brought to the Contracting Officer's attention. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be stepped such that the fill material will bond with the existing surface.

##### 3.10.1 Subgrade Correction

Soft or otherwise unsatisfactory material shall generally be removed and

replaced with satisfactory excavated material or other approved material as directed. Low areas resulting from removal of unsatisfactory material shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified.

### 3.11 FINISHING

All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth-graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade-grader operations, except as otherwise specified. Ditches and gutters shall be finished to permit adequate drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing.

#### 3.11.1 Pavement Subgrade Tolerances

When the final layer of base has been completed, and at the time any additional construction is to be placed thereon, the finished surface of the base shall not vary more than 0.05 feet from the plan elevation.

### 3.12 PLACING TOPSOIL

Topsoil placement is covered in Section 02920 SEEDING, SODDING, AND TOPSOIL. The finished grade shall be such that after subsequent treatment (tillage, topsoiling and planting) the planted grade shall join 1 inch below adjoining surfaced grade of walks, curbs and drives and even with adjoining turfed areas.

### 3.13 COMPACTION

#### 3.13.1 Moisture Control

Control of moisture in the fill shall be maintained to provide acceptable compaction. Dried or crusted cohesive soils shall be plowed, disked or otherwise broken up before compaction. If water is added to fills, the layer shall be spread in even lifts, moistened as necessary, thoroughly mixed, and compacted. Maintain moisture content for select impervious fill between  $W_o - 3$  percent and  $W_o + 1$  percent during placement and compaction.

#### 3.13.2 Placement And Compaction

Each layer shall be spread uniformly on an acceptable soil surface. The type of fill, its maximum uncompacted lift thickness, and the minimum compaction requirements (percent of Standard Proctor density) to which each type of fill shall be compacted shall be as listed below.

| <u>Fill Zone</u>                            | <u>Maximum Uncompacted<br/>Lift Thickness (inches)</u>                  | <u>Percent of Standard<br/>Proctor Density</u> |
|---|---|--|
| General Grading                             | 12  | 95   |
| Building Subgrades<br>Floor Slabs and Steps | 9   | 100  |
| Structure Backfill                          | See Section 02315 EXCAVATION, FILLING AND<br>BACKFILLING FOR STRUCTURES |  |

Levees

12

95

Utility Backfill

See Section 02316 EXCAVATION, TRENCHING, AND  
BACKFILLING FOR UTILITY SYSTEMS

a. Fill materials shall be placed in horizontal layers not exceeding 6 inches loose depth when hand operated compactors are used.

b. Embankments, fill, and subgrade under trails and pavements shall be compacted to at least the percent of Standard Proctor density as follows:

(1) For fill sections the top 36 inches below the aggregate base course shall be placed in uncompacted lifts not exceeding 9 inches and compacted to at least 100 percent of the Standard Proctor density. Below 36 inches, place fill in uncompacted lifts not exceeding 12 inches and compact to at least 98 percent of the Standard Proctor density.

(2) For cut sections in cohesionless soils the subgrade surface shall be compacted to at least 100 percent of the Standard Proctor density. For cut sections in cohesive soils, the subgrade shall be proof rolled and any soft areas shall be brought to the Contracting Officer's attention.

### 3.14 TESTING

#### 3.14.1 General

All testing expenses shall be the Contractor's responsibility. Prior to sampling and testing the work, testing laboratories shall be inspected and approved in accordance with SECTION 01451 CONTRACTOR QUALITY CONTROL. The Contracting Officer reserves the right to direct the location and select the material for samples to be tested and to direct where and when moisture-density tests shall be performed

#### 3.14.2 Field Density Tests

Report forms for summaries of field density tests shall include the minimum information. Additional data required by the applicable ASTM test methods shall be kept on file by the Contractor. Tests shall be numbered sequentially throughout the job, and retests shall reference the original test number (1A, 1B, etc.)/

a. Test Number

b. Dry density, water content and gravel content of field test

c. Proctor Number, maximum dry density, optimum water content, and gravel content

d. Relative Compaction

e. Each test shall be plotted on the graphic presentation of the applicable Proctor test.

#### 3.14.3 Proctor Tests

Report forms for summaries of Proctor tests shall include the minimum information. Additional data required by the applicable ASTM test methods shall be kept on file by the Contractor. Jar samples shall be retained by the testing laboratory for each Proctor test until field testing is completed.

- a. Test Number and method
- b. Sample location and visual soil description
- c. Maximum dry density, and optimum water content
- d. Gravel contents in sample and test specimens

#### 3.14.4 Treatment of Oversize Particles for Density Tests

The fine gravel contents shall be corrected by selecting an appropriate Proctor sample. The fine gravel content shall be the particles retained on the No. 4 sieve and passing the 3/4 inch sieve. The fine gravel content of the field density test shall be within 5 percent of the fine gravel content of the Proctor sample.

The oversize fraction shall be particles retained on the 3/4 inch sieve. For oversize fractions greater than 5 percent, the oversize particles shall be corrected in accordance with the Finer Fraction Method specified in ASTM D 4718.

Each sand cone test shall report the gravel content retained on the No. 4, 3/8 inch and 3/4 inch sieve as appropriate for the Proctor method referenced.

Where nuclear testing is used and lack of uniformity in the soil due to layering, rock or voids are suspected, the test volume site shall be dug up and visually examined to determine if the test material is representative of the full material in general and if rock correction is required.

#### 3.14.5 Corrective Action

Tests of materials which do not meet the contract requirements (failing test) will not be counted as part of the required testing. Each such failing test must be retaken at the same location as the failing test was taken. If testing indicates material does not meet the contract requirements, the material represented by the failing test shall not be placed in the contract work or shall be recompacted or removed. The quantity of material represented by the failing test shall be determined by the Contracting Officer up to the quantity represented by the testing frequency. The Contractor may increase testing frequency in the vicinity of a failing test in order to reduce removal requirements, as approved by the Contracting Officer. Such increases in testing frequency shall be at the Contractor's expense and at no additional cost to the Government.

#### 3.14.6 Testing Schedule

- a. Moisture-Density Relations (ASTM D 698)  
  
One test for each material variation, not less than 3 tests per levee reach total.
- b. In-Place Densities (ASTM D 1556 or ASTM D 2922)

- 1) Typical, 1 test per 2000 cubic yards of fill placed
  - 2) Structure foundations and floor slabs. See Section 02315 EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES.
  - 3) Utility trench backfill. See Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITY SYSTEMS.
- c. Percent Passing No. 200 sieve (ASTM C 117)
- 1) Select Granular Fill, 1 test per 1000 cubic yards of fill placed, not less than 1 test for each source placed
  - 2) Granular Fill, 1 test per 5000 cubic yards of fill placed, not less than 1 test for each source
- d. Sieve Analysis, (ASTM C 136)
- 1) Select Granular Fill, 1 test for each source
- e. Plasticity Index (ASTM D 4318)
- 1) Cohesive soils, 1 test for each Proctor test
  - 2) Impervious fill, 1 test per 5000 cubic yards of fill
  - 3) Select impervious fill, 1 test per 5000 cubic yards of fill
- e. Clay Fraction (percent smaller than 0.002 mm, determined in accordance with ASTM D 422)
- 1) Select impervious fill, 1 test per 5000 cubic yards of fill

### 3.15 NUCLEAR DENSITY TESTING EQUIPMENT

Nuclear density testing equipment shall be used in general accordance with ASTM D 2922 and ASTM D 3017. In addition, the following conditions shall apply:

- a. Prior to using the nuclear density testing equipment on the site, the Contractor shall submit to the Contracting Officer a certification that the operator has completed a training course approved by the nuclear density testing equipment manufacturer, the most recent data sheet from the manufacturer's calibration, and a copy of the most recent statistical check of the standard count precision.
- b. The first test and every tenth test thereafter shall include a sand cone correlation test. The sand cone test shall be centered over the prepared surface for the nuclear test, shall include a nominal 6 inch diameter sand cone, and shall include a minimum wet soil weight of 6 pounds extracted from the hole. In addition, testing of aggregate base soils shall include a minimum of 3 sand cone correlations for each day of testing; and testing of bituminous shall include a minimum of 3 core densities for each day of testing. The density correlations shall be submitted with test results. Each transmittal including density test data shall include a summary of all density correlations for the job neatly prepared on a summary sheet including at a minimum:

- 1) date, meter serial number and operators initials.
- 2) standard count and adjustment data for each test.
- 3) material type.
- 4) probe depth.
- 5) moisture content by each test method and the deviation.
- 6) wet density by each test method and the deviation.

c. The nuclear density testing equipment shall be capable of extending a probe 6 inches minimum down into a hole. The probe shall generally be extended to the maximum depth obtainable.

d. Nuclear density testing equipment used within 2 vertical feet from the existing ground water level, 5 horizontal feet from a vertical wall or massive concrete structure, or in a trench shall have the standard count changed before and after each test, or the manufacturers published correction procedure shall be followed.

e. Nuclear density testing equipment shall not be used during rain.

### 3.16 SUBGRADE AND EMBANKMENT PROTECTION

Compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified herein to the required density prior to further construction thereon. Subgrades not meeting the specifications for finish, material type and density at the time of surface material placement shall be corrected at the Contractor's expense. Cohesive embankments and subgrades shall be kept crowned or sloped for drainage. Newly graded areas shall be protected from traffic and erosion. Any settlement or washing away that may occur from any cause shall be repaired. No base course or pavement shall be laid until the subgrade has been checked and approved by the Contracting Officer. Ditches and drains along subgrade shall be maintained to provide effective drainage. All work shall implement best management practices for erosion control.

-- End of Section --

# DAILY REPORT FORM FOR EARTHWORK OBSERVATION

|                              |               |
|------------------------------|---------------|
| Project Name:                | Date:         |
| Contract Number: DACW37- - - | Temperature   |
| QC Technician/Inspector:     | Precipitation |
| Earthwork Contractor:        |               |

|                                |  |                                   |                                |             |
|--------------------------------|--|-----------------------------------|--------------------------------|-------------|
| Sunny <input type="checkbox"/> | partly cloudy <input type="checkbox"/> | overcast <input type="checkbox"/> | windy <input type="checkbox"/> | Other _____ |
|--------------------------------|--|-----------------------------------|--------------------------------|-------------|

## Stripping and Excavation

| Area<br>(sta., Elevation) | Depth/Thickness<br>Removed | Excavated Material<br>(ASTM D 2488) | Base Material<br>(ASTM D 2488) |
|---------------------------|----------------------------|-------------------------------------|--------------------------------|
|                           |                            |                                     |                                |
|                           |                            |                                     |                                |
|                           |                            |                                     |                                |
|                           |                            |                                     |                                |
|                           |                            |                                     |                                |

## Excavation Equipment:

| Description   | No. Operating | Type (Make & Model or Capacity) |
|---------------|---------------|---------------------------------|
| Dozers        |               |                                 |
| Backhoes      |               |                                 |
| Wheel Loaders |               |                                 |
| Other _____   |               |                                 |

## Fill Placement

| Area (Sta., Elevation)<br>(Grids, depth below FFE) | Fill Material<br>(ASTM D 2488) | Lift Thickness &<br>Number of Passes |
|--|--------------------------------|--------------------------------------|
|  |                                |                                      |
|  |                                |                                      |
|  |                                |                                      |

## Hauling/Placing Equipment:

| Description    | No. Operating | Type (Make & Model or Capacity) |
|----------------|---------------|---------------------------------|
| Trucks         |               |                                 |
| Scrapers       |               |                                 |
| Compactors     |               |                                 |
| Dozers/Graders |               |                                 |
| Other _____    |               |                                 |

Density Tests Taken (list numbers): \_\_\_\_\_

Notes: \_\_\_\_\_  
 \_\_\_\_\_

| DAILY REPORT FORM FOR INSPECTION TRENCH  |                                   |                                 |
|--|-----------------------------------|---------------------------------|
| Project Name: _____  |                                   | Date: _____                     |
| Contract Number: DACW37- - -   |                                   | Temperature _____               |
| QC Technician/Inspector: _____   |                                   | Precipitation _____             |
| Earthwork Contractor: _____  |                                   |                                 |
| Sunny <input type="checkbox"/> partly cloudy <input type="checkbox"/> overcast <input type="checkbox"/> windy <input type="checkbox"/> Other _____   |                                   |                                 |
| <b>Soil Stratigraphy</b>   |                                   |                                 |
| Zone<br>(label in sketch)  | Soil Description<br>(ASTM D 2488) | Water<br>Conditions             |
|  |                                   |                                 |
|  |                                   |                                 |
|  |                                   |                                 |
|  |                                   |                                 |
|  |                                   |                                 |
| Trench base soils  |                                   |                                 |
| <b>Sketch of Trench Profile</b>  |                                   |                                 |
| <div style="display: flex; justify-content: space-between; font-size: small;"> <span>Beginning Sta. _____</span> <span>Ending Sta. _____</span> </div><br>Trench Width: _____<br>Side Slopes (vert., 1V:1H, etc.): _____<br><br>Pipes, tiles, or Conduits: _____<br><small>(indicate sta., depth or elevation, leakage, etc.)</small> _____<br><br>Excavation Equipment: _____ |                                   |                                 |
| Description  | No. Operating                     | Type (Make & Model or Capacity) |
| Backhoes   |                                   |                                 |
| Other _____  |                                   |                                 |
| Fill Material: _____<br>Borrow Area: _____<br><br>Compaction Equipment: _____<br>Lift Thickness: _____<br>Number of passes: _____<br><br>Density Tests Taken (list numbers): _____<br><br>Notes: _____<br>_____<br>_____   |                                   |                                 |



SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02315

EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 DEGREE OF COMPACTION
- 1.3 LINE OF PROTECTION
- 1.4 SUBMITTALS

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Satisfactory Materials
    - 2.1.1.1 Structures Located on Riverside of Levee and Within Line of Protection
    - 2.1.1.2 Structures Located on Landside of Levee
  - 2.1.2 Select Granular Fill
  - 2.1.3 Unsatisfactory Materials
  - 2.1.4 Cohesionless and Cohesive Materials

PART 3 EXECUTION

- 3.1 CLEARING AND GRUBBING
- 3.2 TOPSOIL
- 3.3 EXCAVATION
- 3.4 DRAINAGE AND DEWATERING
  - 3.4.1 Drainage
  - 3.4.2 Dewatering
- 3.5 SHORING
- 3.6 CLASSIFICATION OF EXCAVATION
- 3.7 BLASTING
- 3.8 UTILITY AND DRAIN TRENCHES
- 3.9 BORROW
- 3.10 EXCAVATED MATERIALS
- 3.11 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE
- 3.12 SUBGRADE PREPARATION
- 3.13 FILLING AND BACKFILLING
- 3.14 TESTING
  - 3.14.1 In-Place Densities
    - 3.14.1.1 In-Place Density of Paved Area Subgrades
    - 3.14.1.2 In-Place Density of Structure Subgrade
    - 3.14.1.3 In-Place Density of Fills and Backfills
  - 3.14.2 Optimum Moisture and Laboratory Maximum Density
- 3.15 GRADING
- 3.16 TOPSOIL AND SEEDING
- 3.17 PROTECTION

-- End of Section Table of Contents --



SECTION 02315

EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|            |   |
|------------|---|
| ASTM D 698 | (1998) Laboratory Compaction<br>Characteristics of Soil Using Standard<br>Effort (12,400 ft-lbf/cu. ft. (600<br>kN-m/cu. m.)) |
|------------|---|

|             |   |
|-------------|---|
| ASTM D 2487 | (1998) Classification of Soils for<br>Engineering Purposes (Unified Soil<br>Classification System |
|-------------|---|

1.2 DEGREE OF COMPACTION

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698, abbreviated as percent laboratory maximum density.

1.3 LINE OF PROTECTION

Line of protection includes levee, floodwall, and closures.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Testing; FIO

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

2.1.1.1 Structures Located on Riverside of Levee and Within Line of

## Protection

Satisfactory materials for general and structural backfill for structures located on the riverside of the levee and within the line of protection, pump stations, and storm sewer structures shall be comprised of native soils classified by ASTM D 2487 as SC, CL, CL-ML, and CH, unless otherwise shown.

### 2.1.1.2 Structures Located on Landside of Levee

Satisfactory materials for general and structural backfill for structures located on the landside of the levee shall comprise of any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL, ML, CL-ML, CH, MH.

### 2.1.2 Select Granular Fill

See Section 02300 EARTHWORK for select granular fill requirements.

### 2.1.3 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 3 inches. The Contracting Officer shall be notified of any contaminated materials.

### 2.1.4 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

## PART 3 EXECUTION

### 3.1 CLEARING AND GRUBBING

Clearing and grubbing is specified in Section 02230 CLEARING AND GRUBBING.

### 3.2 TOPSOIL

Stripping topsoil is specified in Section 02300 EARTHWORK.

### 3.3 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure and all work incidental thereof. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with satisfactory material; and payment will be made in conformance with the CHANGES clause of the CONTRACT CLAUSES. Satisfactory material removed below the depths

indicated, without specific direction of the Contracting Officer, shall be replaced, at no additional cost to the Government, with satisfactory materials to the indicated excavation grade; except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

### 3.4 DRAINAGE AND DEWATERING

#### 3.4.1 Drainage

Surface water shall be directed away from excavation and construction sites to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

#### 3.4.2 Dewatering

See Section 01000 GENERAL for dewatering requirements. Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 2 feet below the working level. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.

Crushed rock or granular soils are not allowed beneath structure foundations, unless otherwise shown. Other methods to create a dry, stable subgrade on which to place reinforcement and concrete shall be used that will not create a permeable condition beneath the structure. Remove to the maximum extent possible, pervious materials incorporated into dewatering systems. Prior to placement of backfill the Contracting Officer will determine if materials used in dewatering are removed satisfactorily.

### 3.5 SHORING

See Section 01000 GENERAL for shoring requirements.

### 3.6 CLASSIFICATION OF EXCAVATION

Excavation will be unclassified regardless of the nature of material encountered.

### 3.7 BLASTING

Blasting will not be permitted.

### 3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length.

### 3.9 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained as specified in Section 02300 EARTHWORK.

### 3.10 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Section 02300 EARTHWORK.

### 3.11 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed. For pile foundations, the excavation shall be stopped at an elevation of from 6 to 12 inches above the bottom of the footing before driving piles. After pile driving has been completed, the remainder of the excavation shall be completed to the elevations shown. All surfaces shall be protected from erosion resulting from ponding or flow of water.

### 3.12 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

### 3.13 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials.

Satisfactory materials shall be placed in horizontal layers not exceeding 8 inches in loose thickness, or 6 inches when hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade. Backfill shall not be placed in wet or frozen areas. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 foot above other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes to avoid damage to coatings, or wrappings. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified below:

|  | Percent Laboratory<br><u>maximum density</u> |                                  |
|--|--|----------------------------------|
|  | <u>Cohesive<br/>material</u>                 | <u>Cohesionless<br/>material</u> |
| <u>Fill, embankment, and backfill</u>                              |  |                                  |
| Under structures, paved areas, around<br>footings, and in trenches | 100  | 100                              |
| Under grassed areas  | 95   | 95                               |
| <u>Subgrade</u>  |  |                                  |
| Under structures, steps, and paved<br>areas, top 12 inches         | 100  | 100                              |

Approved compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified herein before to the required density prior to further construction thereon. Recomposition over underground utilities shall be by hand tamping.

### 3.14 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed in accordance with Section 01451 CONTRACTOR QUALITY CONTROL.

#### 3.14.1 In-Place Densities

In-place density and moisture content test results shall be included with the Contractor's daily construction quality control reports.

##### 3.14.1.1 In-Place Density of Paved Area Subgrades

One test per 100 linear feet per lift or fraction thereof.

3.14.1.2 In-Place Density of Structure Subgrade

One test per 250 square feet per lift or fraction thereof.

3.14.1.3 In-Place Density of Fills and Backfills

Not less than 1 test for each 2 vertical feet of fill per 100 linear feet or fraction thereof.

3.14.2 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material, including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per source or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density will be made.

3.15 GRADING

Areas within 5 feet outside of each building and structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

3.16 TOPSOIL AND SEEDING

Placement of topsoil and seeding is specified in Section 02920 SEEDING, SODDING, AND TOPSOIL.

3.17 PROTECTION

Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work, shall be repaired and grades reestablished to the required elevations and slopes.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02316

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITY SYSTEMS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 RELATED WORK OF OTHER SECTIONS
- 1.3 DEFINITIONS

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Unyielding Material
  - 2.1.2 Unstable Material
  - 2.1.3 Select Granular Material
  - 2.1.4 Aggregate Bedding Material
- 2.2 PLASTIC MARKING TAPE

PART 3 EXECUTION

- 3.1 EXCAVATION
  - 3.1.1 Trench Excavation
    - 3.1.1.1 Bottom Preparation
    - 3.1.1.2 Unyielding Material
    - 3.1.1.3 Unstable Material
    - 3.1.1.4 Excavation for Appurtenances
  - 3.1.2 Stockpiles
- 3.2 BACKFILLING AND COMPACTION
  - 3.2.1 Levees
  - 3.2.2 Bedding and Initial Backfill
  - 3.2.3 Final Backfill
  - 3.2.4 Backfill for Appurtenances
- 3.3 TESTING
  - 3.3.1 Testing of Backfill Materials
  - 3.3.2 Field Density Tests
- 3.4 SPECIAL REQUIREMENTS
  - 3.4.1 Burial Depth
  - 3.4.2 Plastic Marking Tape
- 3.5 DISPLACEMENT OF SEWERS

-- End of Section Table of Contents --

SECTION 02316

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITY SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |  |
|-------------|--|
| ASTM D 698  | (1998) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.)) |
| ASTM D 1556 | (1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method  |
| ASTM D 2487 | (1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)                         |
| ASTM D 2922 | (1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)                              |
| ASTM D 3017 | (1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)                          |

ENGINEERING MANUALS (EM)

|            |   |
|------------|---|
| EM 385-1-1 | (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual |
|------------|---|

1.2 RELATED WORK OF OTHER SECTIONS

Dewatering is covered in Section 01000 GENERAL. Material definitions, backfill compaction and testing requirements are covered in Sections 02300 EARTHWORK and 02630 STORM-DRAINAGE SYSTEM.

1.3 DEFINITIONS

Reference to pipes shall include conduits, cables, or other utility systems. Appurtenant structures include manholes, catch basins, inlets, outlets, headwalls, or similar structures.

PART 2 PRODUCTS

2.1 MATERIALS

In addition to the definitions below, material definitions shall be as specified in Section 02300 EARTHWORK.

2.1.1 Unyielding Material

Unyielding material shall consist of rock and gravelly soils with stones greater than 3 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

2.1.2 Unstable Material

Unstable material shall consist of materials too soft and/or compressible to properly support the pipe or appurtenant structure.

2.1.3 Select Granular Material

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 5 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight passing the 3/4 inch sieve.

2.1.4 Aggregate Bedding Material

Aggregate bedding material shall be a well graded mineral product meeting the following gradation requirements:

| <u>Sieve Siz</u> | <u>Percent Passing</u> |
|------------------|------------------------|
| 3/4 inch         | 100                    |
| 3/8 inch         | 90-100                 |
| No. 4            | 35-75                  |
| No. 200          | 0-8                    |

2.2 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

|         |  |
|---------|--|
| Red:    | Electric   |
| Yellow: | Gas, Oil, Dangerous Materials  |
| Orange: | Telephone, Telegraph, Television,<br>Police, and Fire Communications |
| Blue:   | Water Systems  |
| Green:  | Sewer Systems  |

PART 3 EXECUTION

3.1 EXCAVATION

Unless otherwise indicated, trench excavation shall be by open cut except that short sections may be jacked or bored if the utility can be safely and properly installed and ground loss can be properly controlled. All excavation shall be constructed in accordance with the Safety and Health Requirements Manual (EM 385-1-1) and/or OSHA Standards. Allowable trench widths, depths, side slopes, sheet and bracing requirements, and other considerations are given in the OSHA Standard; and an abbreviated version is given in the Safety and Health Requirements Manual. Provide full access to public/private premises and fire hydrants so as to prevent serious disruption of travel. Protect and maintain benchmarks and monuments during excavations.

#### 3.1.1 Trench Excavation

Excavation shall be performed to the lines and grades indicated. During excavation, material satisfactory for backfilling shall be stockpiled in a neat and orderly manner at a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or caving. Topsoil shall be stockpiled separately from suitable backfill material. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed to maintain the stability of the bottom and sides of the excavation. Unauthorized over excavation shall be backfilled at no additional cost to the Government.

##### 3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Pipe shall rest on undisturbed or properly placed and compacted soil along its entire length. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

##### 3.1.1.2 Unyielding Material

Where unyielding material is encountered in the bottom of the trench, such material shall be removed 8 inches below the required grade and replaced with select granular fill, except as provided below.

For levees and all utility systems passing through or beneath levees, the replaced fill shall meet the requirements for the zone where it is located. Use of material more pervious than surrounding soils is not acceptable.

##### 3.1.1.3 Unstable Material

Where wet, soft, unsuitable or otherwise unstable soil incapable of properly supporting pipe is encountered in the bottom of a trench or excavation, the Contractor shall immediately contact the Contracting Officer prior to proceeding with the associated work. When removal of unstable material is required due to inadequate shoring and sheeting, water removal, control of ground water or other similar operations, such unstable material shall be excavated and replaced with satisfactory material as directed at no additional cost to the Government.

##### 3.1.1.4 Excavation for Appurtenances

Excavation for appurtenances shall be of sufficient size to permit the

placement and removal of forms for the full length and width of structure footings and foundations as shown. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

### 3.1.2 Stockpiles

Stockpiles of satisfactory material shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed. Excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government.

## 3.2 BACKFILLING AND COMPACTION

Backfilling shall not begin until construction below finish grade has been approved, storm drainage systems have been inspected, tested and approved; concrete forms have been removed and the excavation cleaned of frost, trash and debris. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall. Trenches not immediately backfilled to grade shall be sloped to drain if practicable. Heavy equipment for spreading and compacting backfill shall not be operated closer to a foundation or other underground structural element than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted with power driven hand tampers suitable for the material being compacted.

Backfill shall consist of satisfactory material meeting the requirements shown and specified. Compaction and testing requirements for backfill shall be as stated in Section 02300 EARTHWORK.

### 3.2.1 Levees

Where pipes are located within the right of way of levees, all fill materials shall meet the type and classification for the fill zone where the trench is located. The portion of the trench in native soils shall be backfilled with the excavated material that matches the surrounding soils.

### 3.2.2 Bedding and Initial Backfill

Bedding shall be of the type and thickness shown. Initial backfill material shall be placed and compacted with manual tampers to a height above the pipe necessary to prevent damage, but not less than one foot. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

### 3.2.3 Final Backfill

Final backfill is all material necessary to complete backfilling at the

trench above the bedding and initial backfill. Final backfill shall consist of native impervious fill, unless otherwise required beneath pavements, adjacent to structures, or other project features. Placement and compaction of final backfill shall comply with the requirements listed in Section 02300 EARTHWORK for the fill zone or feature in which the utility trench is located.

#### 3.2.4 Backfill for Appurtenances

After the structure has been constructed and the concrete has been allowed to cure for 7 days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for backfill in Section 02315 EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

### 3.3 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed in accordance with Section 01451 CONTRACTOR QUALITY CONTROL.

#### 3.3.1 Testing of Backfill Materials

Classification of backfill materials shall be determined in accordance with ASTM D 2487 and the moisture-density relations of soils shall be determined in accordance with ASTM D 698. A minimum of one soil classification and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

#### 3.3.2 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test for each 2 vertical feet of backfill for every 300 feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 1556 and ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017 or ASTM D 2922. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

### 3.4 SPECIAL REQUIREMENTS

#### 3.4.1 Burial Depth

Burial Depth of specific utilities is given below:

- a. Water lines. Trenches shall be of a depth to provide a minimum cover of 7 feet from the existing ground surface or from the indicated finished grade (whichever is lower) to the top of the pipe, unless otherwise indicated.
- b. Cables and Conduits. Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise indicated.

#### 3.4.2 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

#### 3.5 DISPLACEMENT OF SEWERS

After other required tests have been performed and the trench backfill compacted to 2 feet above the top of the pipe, the pipe shall be inspected to determine whether significant displacement has occurred. This inspection shall be conducted in the presence of the Contracting Officer. Pipe sizes larger than 36 inches shall be entered and examined, while smaller diameter pipe shall be inspected by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgement of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to the Government.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02373

GEOTEXTILE

PART 1 GENERAL

1.1 REFERENCES

1.2 SUBMITTALS

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Separation Fabric

2.1.2 Filter Fabric

PART 3 EXECUTION

3.1 GENERAL

-- End of Section Table of Contents --



SECTION 02373

GEOTEXTILE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

|          |   |
|----------|---|
| NDDOT SS | (1997) Standard Specifications for Road and Bridge Construction |
|----------|---|

|                      |  |
|----------------------|--|
| NDDOT SS Section 709 | (1997) Standard Specifications for Road and Bridge Construction - Geotextile Fabrics |
|----------------------|--|

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-13 Certificates

Materials; FIO

Certificate stating the proposed geotextile fabric meets the requirements of the NDDOT SS.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Separation Fabric

Separation fabric shall meet the requirements of NDDOT SS Section 709, Type S2, and all other referenced sections and manuals indicated in NDDOT SS Section 709.

2.1.2 Filter Fabric

Filter fabric shall meet the requirements of NDDOT SS Section 709, Type RR, and all other referenced sections and manuals indicated in NDDOT SS Section 709.

PART 3 EXECUTION

3.1 GENERAL

Grand Forks Phase 2 Levees

All construction shall meet the requirements of the NDDOT SS.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02382

ARTICULATING CONCRETE BLOCK REVETMENTS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 DEFINITIONS
- 1.3 SUBMITTALS
- 1.4 SCHEDULE
- 1.5 DELIVERY, STORAGE AND HANDLING
  - 1.5.1 Blocks
  - 1.5.2 Geotextiles

PART 2 PRODUCTS

- 2.1 ARTICULATING CONCRETE BLOCK
  - 2.1.1 Hydraulic Stability
    - 2.1.1.1 Extrapolation of Hydraulic Stability
  - 2.1.2 Matrix Assembly - Interlocking Blocks
  - 2.1.3 Matrix Assembly - Cabled Systems
  - 2.1.4 Structural requirements
- 2.2 GEOTEXTILE
- 2.3 CABLE
  - 2.3.1 Installation Requirements for Cable
    - 2.3.1.1 Fasteners other than Cable
  - 2.3.2 Design Requirements for Cable
- 2.4 VOID FILLER
  - 2.4.1 Aggregate

PART 3 EXECUTION

- 3.1 SUBGRADE PREPARATION
  - 3.1.1 Clearing
  - 3.1.2 Bank Grading
  - 3.1.3 Compaction and Subgrade Finishing
  - 3.1.4 Grade Tolerances
  - 3.1.5 Subgrade Surface Tolerances
- 3.2 GEOTEXTILE INSTALLATION
  - 3.2.1 Geotextile Seams
- 3.3 BLOCK INSTALLATION
  - 3.3.1 Placement of Pre-Assembled Mattresses
  - 3.3.2 Hand Placement of Interlocking Blocks
  - 3.3.3 Tolerances
- 3.4 CONCRETE JOINTS
  - 3.4.1 Abutments
- 3.5 VOID FILLER
- 3.6 PROTECTION OF WORK
  - 3.6.1 Construction Equipment
- 3.7 QUALITY CONTROL TESTING

-- End of Section Table of Contents --

SECTION 02382

ARTICULATING CONCRETE BLOCK REVETMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 288 (1996) Geotextiles Used for Subsurface  
Drainage Purposes

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 42 (1999) Obtaining and Testing Drilled Cores  
and Sawed Beams of Concrete

ASTM C 140 (2001) Sampling and Testing Concrete  
Masonry Units

ASTM C 1262 (1997) Evaluating the Freeze-Thaw  
Durability of Manufactured Concrete  
Masonry Units and Related Concrete Units

ASTM D 4873 (2001) Identification, Storage, and  
Handling of Geosynthetic Rolls

FEDERAL HIGHWAY ADMINISTRATION (FHWA)

FHWA RD-89-199 (1989) Hydraulic Stability of Articulated  
Concrete Block Revetment Systems During  
Overtopping Flow

1.2 DEFINITIONS

a. Articulating Concrete Block (ACB) Revetment System. A matrix of interconnected concrete block units for erosion protection. Units are connected by geometric interlock and/or cables, geotextiles, or geogrids, and typically include a geotextile underlayment for subsoil retention.

b. Blocks. Articulating concrete block revetment units will be referred to as blocks.

c. Interlocking Blocks. Each pair of abutting blocks shall have interlocking keys that limit lateral expansion. The key and keyhole shall have an interference fit such that the joint movement has a minimum aperture at closure, and a maximum aperture when pulled apart.

The joint freeplay shall allow articulation of each individual block.

d. Freeplay. Freeplay shall be the maximum lateral joint movement for interlocking blocks (difference between maximum and minimum aperture).

### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-04 Drawings

##### ACB Installation Details; GA

Drawings shall be submitted that show details of the ACB Installation. The details shall show the block layout patterns in relation to the feature alignment, anticipated locations of cast-in-place concrete joints, mattress junction details, and proposed installation methods for void filling materials.

#### SD-01 Data

##### ACB and Geotextile Data; GA

Descriptive technical data shall be submitted on the blocks, cables, cable fittings, and geotextile. The submittal shall include all material properties specified under paragraph PRODUCTS. Catalog cuts, technical data sheets, or test data shall be submitted showing that the products meet the specifications. The submittal shall also include a copy of any standard manufacturer's warranties for the products.

#### SD-14 Samples

##### ACB Sample

At the same time as the ACB and Geotextile Data submittal, the Contractor shall submit two samples of the proposed block. The samples shall be typical of the size, texture, color, and finish. If the Contracting Officer is familiar with the product, this submittal may be waived.

#### SD-09 Reports

##### Flume Test for Critical Shear Stress

At the same time as the ACB and Geotextile Data submittal, the Contractor shall submit a report of testing for the ACB in substantial conformance with FHWA RD-89-199. The report shall clearly state if the critical shear stress associated with the stability threshold of the ACB system was derived from laboratory testing that included a sub-block drainage layer as a component of the tested system.

### 1.4 SCHEDULE

To limit ultraviolet light exposure of the geotextile, the blocks shall

generally be placed within 7 days after placing the geotextile, and the void filler shall generally be placed within 14 days after placing the geotextile.

#### 1.5 DELIVERY, STORAGE AND HANDLING

The Contractor shall check products upon delivery to assure that the proper material has been received and is undamaged. For geosynthetics, the guidelines presented in ASTM D 4873 shall be followed.

##### 1.5.1 Blocks

All blocks shall be sound and free of defects that would interfere with proper placement or that would impair the strength or longevity of the installation. Blocks with the following defects shall be discarded:

- a. Blocks with broken appendages.
- b. Blocks with chips larger than 2 inches in any dimension.
- c. Blocks with cracks wider than 0.02 inches and longer than 33% of the nominal height.

Minor cracks incidental to the usual method of manufacture, or chipping that results from customary methods of handling in shipping, delivery and placement will not be deemed grounds for rejection

Blocks shall be stored in a suitable location away from mud, paint, wet cement, and other contamination or disturbance.

##### 1.5.2 Geotextiles

- a. Labeling. Each roll shall be labeled with the manufacturer's name, product identification, roll dimensions, lot number, and date manufactured.
- b. Handling. Geosynthetic rolls shall be handled and unloaded by hand, or with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Geosynthetic rolls shall not be dragged, lifted by one end, lifted by cables or chains, or dropped to the ground.
- c. Storage. Geotextiles shall be protected from cement, paint, excessive mud, chemicals, sparks and flames, temperatures in excess of 160 degrees F, and any other environmental condition that may degrade the physical properties. If stored outdoors, the rolls shall be elevated from the ground surface. Geotextiles shall be protected with an opaque waterproof cover. Geotextiles shall be delivered to the site in a dry and undamaged condition.

## PART 2 PRODUCTS

### 2.1 ARTICULATING CONCRETE BLOCK

The ACB shall meet the following criteria:

TABLE 1. ACB Requirements

| <u>Criteria</u>                                      | <u>Required Valu</u> | <u>Test Method</u> |
|--|----------------------|--------------------|
| Matrix Assembly: Interlocking Blocks / Cabled System |                      |                    |
| Thickness, minimum                                   | 4 inches             | N/A                |
| Net Weight/Area, minimum                             | 30 psf               | Note a.            |

TABLE 1. ACB Requirements

| Criteria                                  | Required Value | Test Method    |
|---|----------------|----------------|
| Critical Shear Stress, minimum            | 3.5 psf        | FHWA RD-89-199 |
| Critical Velocity, minimum                | 15 ft/sec      | FHWA RD-89-199 |
| Curvature Radius, maximum                 | 3 feet         | Note b.        |
| Surface Void Area Ratio                   | 25% - 40%      | Note c.        |
| Drainage Correction Factor (DCF)          | 20% - 35%      | Note d.        |
| Block/Geotextile Interface Friction Angle | 35 degrees     | Note e.        |

a. The weight of the mattress per unit area shall be determined with the nominal joint spacing, in a non-submerged condition.

b. The curvature radius shall be indicative of the ability of the assembled mattress to conform to one dimensional subgrade curves without binding, such as for anchor trenches and swales. The curvature radius shall be demonstrated, if requested by the Contracting Officer.

c. The surface void area ratio shall be determined at the visible (with filled voids) surface of the blocks, with the joints spaced in a neutral position (50%), and shall be expressed as a percentage of the gross mat area. The void area shall include area between the blocks and open cells within the block.

d. The drainage correction factor shall be the minimum void area ratio (usually taken at the base of the blocks), with the joints spaced in a neutral position (50% freeplay in each direction), and shall be expressed as a percentage of the gross mat area.

e. The concrete surface shall be sufficiently rough to prevent sliding of the blocks on the geotextile. The interface friction must be matched with the selected block and geotextile combination, and shall be included with the ACB and Geotextile Data submittal. The block/geotextile interface friction angle shall be demonstrated, if requested by the Contracting Officer.

#### 2.1.1 Hydraulic Stability

The ACB product shall have been tested in a flume chamber in substantial conformance with FHWA RD-89-199, except that a drainage layer is not required. If the product was tested with a drainage layer, the installed product shall incorporate a similar drainage layer with adequate filtration design for the site soils. The flume test shall be based on conservative assumptions for field placement of the blocks (such as block orientation, and joint spacing within construction tolerances). The critical shear stress (and critical velocity) shall be indicated in the test report.

##### 2.1.1.1 Extrapolation of Hydraulic Stability

Extrapolation of critical shear stress for untested blocks within a similar family of ACB shall be subject to limitations. Extrapolation shall only be used for blocks having a similar footprint area and interlock mechanism, but with variable thickness or net weight/area. Extrapolation shall only be accepted if the following conditions are met:

a. The extrapolation is in strict accordance with hydraulic similitude methods commonly accepted by the industry, and includes quantitative treatment for a block overturning failure mode.



- b. The tested block is the smaller product size in both thickness and net weight/area, and extrapolation does not extend the critical velocity more than 10 feet per second from the tested product size.

#### 2.1.2 Matrix Assembly - Interlocking Blocks

Interlocking blocks are assumed to function without the use of cables or similar restraints. Void filler shall be placed to inhibit lateral movement and block pullout, cover the geotextile, and increase hydraulic stability.

#### 2.1.3 Matrix Assembly - Cabled Systems

Cable tied concrete block shall be interconnected by flexible cables running through the blocks. Each block shall be penetrated by a cable that allows articulation of the blocks, but restrains removal of individual blocks. Void filler shall be placed to inhibit lateral movement, cover the geotextile, and increase hydraulic stability. Articulating concrete block, cables, and fittings shall be fabricated into mattresses at the manufacturer's plant.

#### 2.1.4 Structural requirements

Articulating concrete block shall be wet cast using concrete as specified herein, or dry-cast by a vibratory block forming machine. The blocks shall be manufactured to the following requirements:

- a. The minimum compressive strength shall be 4000 psi for an average of 3 units, and 3500 psi for an individual unit. Compressive strength shall be determined by ASTM C 42 for wet cast blocks, or by ASTM C 140 for dry cast blocks.
- b. The maximum water absorption for dry cast units shall be 9 pcf for an average of 3 units, and 12 pcf for an individual unit. Water absorption shall be determined by ASTM C 140.
- c. The minimum saturated surface-dry density shall be 140 for average of 3 units, and 140 for an individual unit.
- d. Wet cast concrete shall be air entrained to contain between 4 and 7 percent total air.
- e. For freeze-thaw durability tested in accordance with ASTM C 1262, specimens shall comply with either of the following: (1) the weight loss of each of 5 specimens after 100 cycles shall not exceed 1 percent; or (2) the weight loss of each of 5 specimens after 150 cycles shall not exceed 1.5 percent.

### 2.2 GEOTEXTILE

Geotextile used as filters below the ACB shall be a non-woven fabric. The geotextile shall meet the material properties specified in AASHTO M 288 for Class 2 strength property requirements and for permanent erosion control. Filter requirements in AASHTO M 288 shall be based on in-situ soil with greater than 50% passing the 0.075 mm sieve opening.

### 2.3 CABLE

#### 2.3.1 Installation Requirements for Cable

Cable used for preassembled mattresses shall be sufficiently sized and fastened for the size/weight of the assembled mattresses such that the assembled mattresses can be placed in compliance with OSHA standards. The manufacturer shall be responsible for determining the minimum cable strength compatible with the mattress size for safe handling. Cable strength shall be based on a minimum factor of safety of 5, and include appropriate reduction factors for mechanically crimped cable, and other fasteners. If applicable, loading conditions shall include the use of a spreader bar for placing the mattresses.

#### 2.3.1.1 Fasteners other than Cable

Any systems which rely on geotextiles (or other fabric integral with the mattress) to maintain block-to-block interconnection shall meet the applicable portions of this specification for cables. Geosynthetics strength shall include appropriate factors of safety, with particular attention given to the grab points.

#### 2.3.2 Design Requirements for Cable

ACB's that rely on cables to maintain block to block interconnection shall use ropes manufactured from polyester, stainless steel wire, or galvanized steel wire. The cable shall have a minimum breaking strength of \_\_\_\_\_ pounds.

Polyester rope shall be constructed of high tenacity, low elongating, continuous filament polyester fibers; and shall consist of a core construction comprised of parallel fibers contained within an outer jacket or cover.

#### 2.4 VOID FILLER

##### 2.4.1 Aggregate

Aggregate for filling the voids in the block shall meet the requirements of drainage aggregate specified in Section 02832 SEGMENTAL CONCRETE BLOCK RETAINING WALL.

### PART 3 EXECUTION

#### 3.1 SUBGRADE PREPARATION

The ACB revetment shall be placed on undisturbed native soils, or acceptably placed and compacted fill. The ACB shall not be placed on surfaces that contain mud, frost, organic soils, embankment that has not met compaction requirements, or where the Contracting Officer determines that unsatisfactory material remains in or under the subgrade.

##### 3.1.1 Clearing

All vegetation shall be completely removed Section 02230 CLEARING AND GRUBBING. Remaining roots from trees and brush shall be removed to a depth of 1 foot below the subgrade surface. Loose roots and twigs, turf clods, stones larger than 1/2 inch diameter, and other debris shall be raked and removed from the final surface. Rills and gullies from erosion shall be corrected.

##### 3.1.2 Bank Grading

Grading shall be finished to a smooth surface, typical of that obtainable with a dozer and blade. A rough surface typically obtained with a backhoe or dragline shall not be acceptable, except when ACB placement in water is shown on the drawings or approved by the Contracting Officer.

### 3.1.3 Compaction and Subgrade Finishing

Fill soils shall be compacted to the specified density in Section 02300 EARTHWORK. Incidental grading (where embankment is not otherwise specified) shall be compacted by heavy equipment or by tamping with a bucket to a density characteristic of the surrounding soils. The final surfaces accessible by compaction equipment shall be compacted with a smooth drum roller or vibratory plate tamper until there is no further evidence of consolidation. Where slopes limit operation of compaction equipment, the final surface shall be back-dragged to a dense smooth surface with bladed equipment. Localized loose or soft zones shall be corrected.

### 3.1.4 Grade Tolerances

The grading tolerance shall be within 2 inches from the prescribed elevations, with no abrupt variations that would cause unacceptable projections of individual blocks.

### 3.1.5 Subgrade Surface Tolerances

The subgrade shall be maintained in a smooth condition between installation of the geotextile and the blocks. Windrows, stones, clods of cohesive soil, and irregularities shall be raked smooth. Ruts, rills and gullies resulting from traffic, precipitation runoff, groundwater seepage, etc. shall be corrected prior to installation of blocks.

## 3.2 GEOTEXTILE INSTALLATION

The geotextile shall be laid flat and smooth so that it is in direct contact with the subgrade. The geotextile shall be free of tension, folds, and wrinkles. The number of seams and overlaps shall be minimized by selective orientation of geotextile panels, within the limitations of maintaining a consistent pattern. Geotextile shall be placed immediately prior to block installation, if necessary to limit damage to the geotextile from equipment or repeated pedestrian traffic and limit disturbance of the subgrade from precipitation or runoff.

### 3.2.1 Geotextile Seams

Seams shall be overlapped a minimum of 18 inches. Seams on slopes and butt end seams shall be shingled so that runoff and channel flow passes over the fabric. Geotextile panels shall be secured before block placement by adequate sandbags, spare blocks, or pins/staples.

## 3.3 BLOCK INSTALLATION

All placement of blocks shall be in accordance with the manufacturer's recommendations and the Contractor's approved shop drawings.

### 3.3.1 Placement of Pre-Assembled Mattresses

Placement of pre-assembled mattresses shall be done with mattresses

attached to a spreader bar to aid in lifting, aligning and placing the mattresses. The mattresses shall be placed directly into position, with a maximum space or gap between mattresses of 3 inches in excess of the nominal joint spacing of blocks within the mattress. Mattresses out of alignment shall be lifted and reset. Mattresses shall not be pushed or pulled laterally after they are in contact with the geotextile. No overlapping of mats will be accepted and no blocks shall project vertically more than 1 inch beyond the adjacent blocks. As adjacent mats are placed, they shall be secured to each other by fastening the protruding horizontal and vertical cable connections and end cable loops together along each side of the mats.

### 3.3.2 Hand Placement of Interlocking Blocks

Hand placed blocks shall be spaced to maximize the ACB ability to articulate. The Contractor shall use adequate alignment control, such as string lines, to keep the block pattern in alignment and the joint spacing consistent and uniform. Initially, no more than two working block rows shall progress simultaneously in the direction of placement. Additional working rows may be added after experience shows that true lines are maintained. The starting position for ACB placement shall be a convenient location for control of the block pattern alignment. The Contracting Officer shall approve of the starting position for placement of the ACB.

a. Target Joint Spacing. Interlocking blocks shall be installed with a uniform aperture in the interlocking connections. The target joint spacing shall be neutrally spaced with equal free-play for the joint to open and close.

b. Correction of Joint Spacing. If the block pattern becomes skewed to an extent that blocks bind, joints close, or blocks stickup, then the placed ACB that is determined to be out of tolerance shall be removed and replaced. Where the nonconformance of the joint spacing is due to project features, such as warped slopes or anchor trenches, then cast-in-place concrete joints shall be field located in concurrence with the Contracting Officer.

c. Maintenance of Joint Spacing. If the block pattern becomes skewed to an extent that the joint freeplay is not acceptable to the Contracting Officer, then cast-in-place concrete joints shall be field located as directed by the Contracting Officer.

d. Block Layout Pattern Dependent on Project Features. If the block pattern is shown to be maintained parallel and perpendicular to selected project features, such as the crest/toe of levee/channel slopes, then field location of cast-in-place concrete joints shall be implemented as needed, and as directed by the Contracting Officer.

### 3.3.3 Tolerances

Maximum acceptable block projections (vertical offset from adjacent blocks) for "installation in the dry" shall not exceed 0.5 inches for interlocking blocks 1.0 inch for cabled systems. Typical block projections shall be less than half the maximum projections.

### 3.4 CONCRETE JOINTS

Use of cast in place concrete joints shall be minimized to the extent practicable. The Contracting Officer shall be informed of all concrete

joints not shown on shop drawings prior to field placement.

Joints that shall require concrete include:

Joints between cable tied mattresses where the joint is 3 inches wider than the nominal joint.

Joints where block interlock is discontinuous.

Abutments where the ACB meets headwalls, pipe penetrations, or sidewalks.

Any areas where there are partial blocks (to avoid small blocks with reduced hydraulic stability).

Field placed concrete shall be proportioned for similar strength and durability properties as the ACB concrete, and shall meet applicable portions of SECTION 03300 CAST IN PLACE STRUCTURAL CONCRETE. All cable ties and anchoring shall be completed prior to placing concrete.

#### 3.4.1 Abutments

The ACB shall abut structures and head walls in a neat appearance. Unless a specific detail is indicated on the drawings, voids shall be filled with partial blocks and the gap shall be filled with cast-in-place concrete. The concrete shall be installed flush with the surface of the blocks, and shall be float finished.

#### 3.5 VOID FILLER

The voids of the articulating concrete block mats shall be filled with aggregate void filler. All cable ties and anchoring shall be completed prior to filling voids.

#### 3.6 PROTECTION OF WORK

Work shall be protected against damage from subsequent operations. Displaced or broken blocks shall be removed and replaced to conform to all requirements of this section. Damaged material shall not be incorporated. Equipment shall not be allowed on the ACB that could crack, cause abrasion, or otherwise damage the blocks.

##### 3.6.1 Construction Equipment

Vehicles shall not operate directly on geotextile, except that rubber tired vehicles may operate directly on short reaches of geotextile that meets or exceeds AASHTO M 288 survivability requirements for Class 1 geotextile, if there is no rutting, if the vehicle access is necessary to accomplish the work, and if the Contracting Officer observes the operation and approves.

Vehicles shall not operate on the ACB until (during or after) placement of void filler. Vehicle traffic on the ACB shall be restricted to light weight rubber tired vehicles, and where intermittent access is necessary to accomplish the work. Routine haul routes shall not be established on the ACB. These allowances shall not waive the Contractor's obligation to maintain the installation until acceptance, and verify that vehicle access does not crack, or in any way damage, the ACB.

#### 3.7 QUALITY CONTROL TESTING

The following testing shall be performed independent of the manufacturing process, by an agency other than the manufacturer. The ACB blocks shall be

Grand Forks Phase 2 Levees

sampled and tested for compressive strength, water absorption and unit weight. The sample frequency shall be 3 specimens for each 1000 SY. Test methods shall be consistent with those specified in PART 2 PRODUCTS.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02388

STONE PROTECTION (RIPRAP)

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS

PART 2 PRODUCTS

- 2.1 STONE SOURCES AND EVALUATION
  - 2.1.1 Alternate Sources
  - 2.1.2 Acceptance of Materials
- 2.2 RIPRAP
  - 2.2.1 General
  - 2.2.2 Production
- 2.3 BEDDING MATERIAL
- 2.4 GEOTEXTILE
- 2.5 SOURCE QUALITY CONTROL
  - 2.5.1 Sampling Requirements
  - 2.5.2 Riprap Gradation Testing
    - 2.5.2.1 Riprap Test Method A
    - 2.5.2.2 Riprap Test Method B
  - 2.5.3 Riprap Bedding Gradation Testing
    - 2.5.3.1 Gradation Tests for Riprap Bedding
- 2.6 STOCKPILES

PART 3 EXECUTION

- 3.1 LAND PLACED RIPRAP (R270 AND R45 RIPRAP)
  - 3.1.1 Construction Tolerances
    - 3.1.1.1 Subgrades
    - 3.1.1.2 Layer Thickness
    - 3.1.1.3 Surface Tolerances
  - 3.1.2 Foundation Preparation
  - 3.1.3 Placement of Geotextile
    - 3.1.3.1 Construction Requirements
  - 3.1.4 Placement of Bedding Material on Geotextile
  - 3.1.5 Placement of Riprap
    - 3.1.5.1 Layer Requirements
    - 3.1.5.2 Construction Methods
    - 3.1.5.3 Riprap Placement on Geotextile
- 3.2 MARINE PLACED RIPRAP
  - 3.2.1 Construction Tolerances
    - 3.2.1.1 Subgrades
    - 3.2.1.2 Layer Thickness
  - 3.2.2 Placement of Riprap
    - 3.2.2.1 Layer Requirements
    - 3.2.2.2 Construction Methods

Grand Forks Phase 2 Levees

3.3 MAINTENANCE

3.4 CONTRACTOR QUALITY CONTROL

-- End of Section Table of Contents --



SECTION 02388

STONE PROTECTION (RIPRAP)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33 (1999a) Concrete Aggregates

ASTM C 136 (1996a) Sieve Analysis of Fine and Coarse Aggregates

CORPS OF ENGINEERS (COE)

EM 1110-2-1906 (1986) Laboratory Soils Testing

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

NDDOT SS Section 709 (1997) Standard Specifications for Road and Bridge Construction - Geotextile Fabrics

NDDOT SS Section 858 (1997) Geotextile Fabric

1.2 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Geotextile Data; FIO

Catalog cuts or technical data sheet shall be submitted for the geotextile showing that the product meets the specifications

SD-08 Statements

Material Sources; GA.

The Contractor shall designate in writing only one source or one combination of sources from which he proposes to furnish stone. The Contractor shall state in writing methods of processing and handling riprap, and shall notify the Contracting Officer when production methods are changed.

SD-09 Reports

Gradation Test; FIO.

Gradation Test Results for riprap and aggregates. Riprap gradation testing results shall be submitted on the WORKSHEET FOR GRADATION ANALYSIS OF RIPRAP and the gradation curve (form 4055). A blank copy of each form is included at the end of this section.

SD-13 Certificates

Certified Weight Scale Tickets; FIO.

Copies of all certified weight scale tickets shall be furnished to the Contracting Officer at a frequency as directed. The tickets do not need to be formally submitted through the submittal process.

PART 2 PRODUCTS

2.1 STONE SOURCES AND EVALUATION

Stone and aggregate materials may be quarried rock or durable fieldstone and shall be produced or obtained from the sources listed in Section 00830 ATTACHMENTS. If the Contractor proposes to furnish materials from a source not listed, the Government Geologist will make such investigations and evaluations as necessary to determine whether or not materials with acceptable durability can be produced from the proposed source. The rock supplied shall be composed of a quality fieldstone or be quarried from one rock formation to provide a product of uniform appearance. The Contractor shall not supply rock from various formations, or mix field stone with quarried rock, unless approved by the Contracting Officer. It is the Contractor's responsibility to determine that the stone source or combination of sources selected is capable of providing the quality, quantities and gradation needed and at the rate needed to maintain the scheduled progress of the work.

2.1.1 Alternate Sources

If the Contractor proposes to furnish stone materials from a source not listed in Section 00830 ATTACHMENTS, the Government Geologist will make such investigations and evaluations as necessary to determine whether or not materials meeting the requirements specified can be produced from the proposed source. Alternate sources from which the Contractor proposes to obtain stone materials shall be selected and submitted for approval at least 30 days in advance of the time when the material will be required.

2.1.2 Acceptance of Materials

Acceptance of a source of stone is not to be construed as acceptance of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels, when such materials are unsuitable for stone as determined by the Contracting Officer. The Contracting Officer also reserves the right to reject individual units of produced specified materials in stockpiles at the quarry, all transfer points, and at the project construction site when such materials are determined to be unsuitable.

2.2 RIPRAP

Riprap gradation shall meet the requirements for R270, R45, and R20 riprap indicated on the attached FORM 4055. The stone shall be well graded within the limits specified.

#### 2.2.1 General

All stone shall be durable material. Stone for riprap shall have a specific gravity between 2.55 and 2.75 unless approved by the Contracting Officer. Stone shall be of a suitable quality to ensure permanence in the structure and in the climate in which it is to be used. It shall be free from cracks, blast fractures, bedding, seams and other defects that would tend to increase its deterioration from natural causes. The stone shall be clean and reasonably free from soil, quarry fines, and shall contain no refuse. Any foreign material adhering to or combined with the stone as a result of stockpiling shall be removed prior to placement. Neither the breadth nor the thickness of any piece of stone shall be less than one-third of it's length. Occasional pieces of stone slightly larger than the maximum weight will be permitted provided the gradation and voids are not unduly affected and that surface tolerances are met.

#### 2.2.2 Production

Riprap shall be handled and selectively loaded onto trucks in a manner to avoid segregation and provide a distribution of stone sizes consistent with the gradation band and test samples. Each truckload shall be representative of the gradation requirements.

#### 2.3 BEDDING MATERIAL

Bedding material shall consist of cobbles, gravel, and sand or crushed stone and shall be well graded. The bedding material shall be composed of tough, durable particles, adequately free from thin, flat and elongated pieces, and shall contain no organic matter nor soft, friable particles in quantities considered objectionable by the Contracting Officer. The aggregate shall meet the quality requirements of ASTM C 33. Grading shall conform to the following requirements:

| U.S. STANDARD SIEVE | PERMISSIBLE LIMITS<br>PERCENT BY WEIGHT, PASSING |
|---------------------|--|
| BEDDING STONE       |  |
| 6 in.               | 100  |
| 4 in.               | 79-100   |
| 3 in.               | 71-89  |
| 1-1/2 in.           | 54-71  |
| 3/4 in.             | 38-54  |
| 3/8 in.             | 22-38  |
| No. 4               | 7-22   |
| No. 10              | 0-5  |

The bedding materials shall be well-graded between the limits shown. At least one test shall be performed on each 1000 tons to be delivered to the project site in accordance with ASTM C 136. All points on individual grading curves obtained from representative samples of bedding material shall lie between the boundary limits as defined by smooth curves drawn through the tabulated gradation limits plotted on ENG FORM 2087 or similar form. The individual gradation curves within these limits shall not exhibit abrupt changes in slope denoting either gap grading or scalping of

certain sizes or other irregularities which would be detrimental to the proper functioning of the filter. Geotextile shall be as specified below.

#### 2.4 GEOTEXTILE

Geotextile shall meet the requirements of NDDOT SS Section 858, geotextile fabric for riprap (Type RR).

#### 2.5 SOURCE QUALITY CONTROL

Sampling and testing shall be performed by and at the expense of the Contractor at no additional cost to the Government. Gradation tests shall be performed by either Method A or B at the frequency listed below. A satisfactory gradation test shall be obtained prior to any hauling and delivery of materials. All tests, including failing tests shall be submitted. Tests performed on material which do not meet gradation and shape requirements will not be counted as part of the tests required. The Contracting Officer shall be informed immediately of test results and draft copies of test results shall be furnished at the Contracting Officers request.

##### 2.5.1 Sampling Requirements

The Contracting Officer shall direct the time and location of sampling, unless waived. Samples shall be taken from stockpiles or loaded trucks, and not directly from conveyers or chutes.

##### 2.5.2 Riprap Gradation Testing

a. Notification. The Contracting Officer shall be informed 24 hours before each riprap test

b. Testing Frequency. At least 1 gradation test shall be performed per source prior to delivery to the project site. Perform 1 test of riprap stockpiled or delivered to the project site.

c. Sample Size. The sample shall have a minimum gross weight not less than 25 times the maximum stone size in the specified gradation ( $25 * W_{10}$ ).

##### 2.5.2.1 Riprap Test Method A

Test method A shall consist of weighing all stones larger than 5 pounds in a sample. Five to seven weight classes shall be selected within the range of stone sizes. Each stone shall be weighed and recorded on the work sheet for method A. The weight of stones shall be summed for each weight class; after which calculations and a plot of the gradation shall be completed in accordance with accepted practice for soil and aggregate gradations

##### 2.5.2.2 Riprap Test Method B

Test Method B shall consist of separating the stones into 5 to 7 piles, ordered by size. The sample shall be separated on a clean, hard surface that is free of smaller stones that could become mixed with the sample. The stones shall be visually screened to place them into appropriate piles. All stones shall be separated and placed into a pile before weighing. After separating, the smallest and largest rock in each pile shall be weighed and recorded. The stones shall be adjusted as necessary so that the weight classes do not overlap. After adjustment is adequate and weight classes

have been established, each pile of stone shall be weighed and recorded on the work sheet for Method B. Calculations and a plot of the gradation shall be completed in accordance with accepted practice for soil and aggregate gradations

#### 2.5.3 Riprap Bedding Gradation Testing

a. Notification: The Contracting Officer shall be informed 24 hours before each riprap bedding test.

b. Testing frequency: At least 1 gradation test shall be performed per source prior to delivery to the project site. Perform 1 test of riprap bedding stockpiled or delivered to the project site.

c. Sample size: The sample shall have a minimum gross weight of 150 pounds.

##### 2.5.3.1 Gradation Tests for Riprap Bedding

The sampling and testing procedures for gradation tests for bedding shall be in accordance with EM 1110-2-1906. Report results on ENG FORM 2087, GRADATION CURVES, provided at the end of this Section.

#### 2.6 STOCKPILES

Stockpiles shall be formed by a series of layers or truckload dumps, where the rock essentially remains where it is placed. Subsequent layers shall be started 10 feet from the edge of the previous layer so that the rock will not roll down the edges of the pile. Any stone which has become contaminated with soil or refuse shall not be put into the work unless the contaminating material has been removed prior to placement.

### PART 3 EXECUTION

#### 3.1 LAND PLACED RIPRAP (R270 AND R45 RIPRAP)

##### 3.1.1 Construction Tolerances

Work shall generally meet the required elevations, slope and grade; and the outer surfaces shall be even and present a neat appearance.

###### 3.1.1.1 Subgrades

Areas on which stone protection will be placed shall be graded and/or dressed to conform to cross sections shown on the contract drawings within 2 inches above or below the neat lines. The surface shall be reasonably smooth to match tolerances normally obtained by rough grading with bladed equipment. For subaqueous construction in greater than 3 feet of water, the tolerance shall be 6 inches.

###### 3.1.1.2 Layer Thickness

Any layers found to be less than 80% of the specified thickness shall be corrected. This tolerance shall only be exceeded on isolated spot checks, and if the tolerance is commonly exceeded, the Contractor shall change his construction methods to improve the quality control. If it is necessary to estimate riprap quantities for changes, the volume shall be based on neat

line dimensions and the plan dimension for thickness. A conversion factor of 1.5 tons/CY shall be used to determine quantity requirements, unless otherwise directed by the Contracting Officer.

#### 3.1.1.3 Surface Tolerances

The finished surface tolerance above the neat line shall generally not deviate from the lines and grades shown by more than half (1/2) the average stone dimension of the gradation range. Riprap that has a rough and uneven surface shall be reworked by hand to stabilize stones that wobble and are out of tolerance, except where the Contracting Officer approves use of equipment. Rearranging of individual stones shall be required to the extent necessary to obtain a well-graded distribution of stone sizes.

#### 3.1.2 Foundation Preparation

Foundation areas shall be excavated or filled to the lines and grades shown. Filling shall be with earth similar to the adjacent material and shall be well compacted. Immediately prior to placing riprap, the prepared subgrade will be inspected by the Contracting Officer unless waived; and no material shall be placed thereon until that area has been approved.

#### 3.1.3 Placement of Geotextile

##### 3.1.3.1 Construction Requirements

Installation, overlapping fabric and equipment restrictions shall conform with requirements of NDDOT SS Section 709. Geotextile fabric shall be placed perpendicular to the direction of flow with the upstream strip overlapping the downstream strip.

#### 3.1.4 Placement of Bedding Material on Geotextile

Bedding material shall be spread uniformly on the geotextile to the slope lines and grades as indicated on the contract drawings and in such manner as to avoid damage to the geotextile. Placement shall begin at the bottom of the area to be covered and continue up slope. Subsequent loads of material shall be placed against previously placed material in such a manner as to ensure a relatively homogenous mass. Placing of bedding material by methods which tend to segregate the particle sizes within the layer will not be permitted. Any damage to the surface of the geotextile during placement of bedding material shall be repaired before proceeding with the work. Compaction of material placed on the geotextile will not be required, but shall be finished to present an adequately even surface, free from mounds or windrows.

#### 3.1.5 Placement of Riprap

##### 3.1.5.1 Layer Requirements

Riprap shall be placed in a manner which will produce a well-graded mass of rock with the minimum practicable percentage of voids. The large stones shall be well distributed. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones.

##### 3.1.5.2 Construction Methods

Unsegregated stone shall be placed in a systematic manner. Riprap shall be placed to its full course thickness in one operation and in such manner as

to avoid displacing underlying material. Placement shall typically begin at the bottom of the area to be covered and continue up slope. Subsequent loads of material shall be placed against previously placed material in such a manner as to ensure a relatively homogenous mass. Final finish of slope shall be performed as the material is placed.

Placing riprap in layers will not be permitted. Placing riprap by dumping it into chutes, or by any method likely to cause segregation of the various sizes, shall not be permitted. Placing riprap by dumping it at the top of the slope and pushing it down the slope shall not be permitted. No equipment shall be operated directly on the completed stone protection system. Dump trucks shall be equipped with bottom hinged tailgates if rock is directly placed into position with the trucks.

#### 3.1.5.3 Riprap Placement on Geotextile

Riprap shall be placed over the geotextile by methods that do not tear, puncture, or reposition the fabric. Equipment shall be operated so as to minimize the drop height of the stone without contacting and damaging the geotextile. Generally this will be about 1 foot of drop from the bucket to the placement surface. Riprap shall be placed so that stones do not roll downhill.

### 3.2 MARINE PLACED RIPRAP

#### 3.2.1 Construction Tolerances

Work shall generally meet the required elevations, slope and grade; and the outer surfaces shall be even and present a neat appearance.

##### 3.2.1.1 Subgrades

Areas on which stone protection will be placed shall be graded and/or dressed to conform to slope requirements shown on the contract drawings. The surface shall be reasonably smooth. For work in the Red River channel, Contractor shall minimize disturbance of the river bottom.

##### 3.2.1.2 Layer Thickness

Any layers found to be less than 80% of the specified thickness shall be corrected. This tolerance shall only be exceeded on isolated spot checks, and if the tolerance is commonly exceeded, the Contractor shall change his construction methods to improve the quality control.

#### 3.2.2 Placement of Riprap

##### 3.2.2.1 Layer Requirements

Riprap shall be placed in a manner which will produce a well-graded mass of rock with the minimum practicable percentage of voids. The large stones shall be well distributed. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones.

##### 3.2.2.2 Construction Methods

Placement of R20 riprap bank stabilization shall be by marine methods. Unsegregated stone shall be placed in a systematic manner. Riprap shall be placed to its full course thickness in one operation and in such manner as to avoid displacing underlying material. Placement shall typically begin

at the bottom of the area to be covered and continue up slope. Subsequent loads of material shall be placed against previously placed material in such a manner as to ensure a relatively homogenous mass. Final finish of slope shall be performed as the material is placed.

Placing riprap in layers will not be permitted. Placing riprap by dumping it into chutes, or by any method likely to cause segregation of the various sizes, shall not be permitted. Placing riprap by dumping it at the top of the slope and pushing it down the slope shall not be permitted.

### 3.3 MAINTENANCE

The Contractor shall maintain the stone protection and underlying works until accepted by the Contracting Officer. When appropriate, the Contractor shall place stone protection in a timely manner to reduce risk of scour. Any material displaced prior to acceptance and due to the Contractor's negligence or neglect shall be replaced at the Contractor's expense.

### 3.4 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain quality control for all work performed at the job site under this section to assure compliance with contract requirements. He shall maintain records of his quality control tests, inspections and corrective actions. Quality control measures shall cover all construction operations including, but not limited to, the placement of all materials to the slope and grade lines shown and in accordance with this section.

In addition to the Contractor's system to establish and maintain quality control for stone placement operations, the following information shall be recorded and promptly provided to the Contracting Officer on request:

- a. Record tonnage of stone placed in completed sections of the work and check quantity for compliance with design sections.
- b. Check for uniform thickness of material layers.

-- End of Section --



|   |
|---|
| WORK SHEET FOR GRADATION ANALYSIS OF RIPRAP<br>METHOD A |
|---|

|               |       |
|---------------|-------|
| Project Name: | Date: |
|---------------|-------|

|              |          |
|--------------|----------|
| Riprap Type: | Test No. |
|--------------|----------|

|                         |  |
|-------------------------|--|
| Source, Quarry, or Pit: |  |
|-------------------------|--|

|                  |               |
|------------------|---------------|
| Sample Location: | Test Made By: |
|------------------|---------------|

|   |
|---|
| Part 1. Weigh all stones larger than 5 pounds and record. |
|---|

|                  |       |  |  |  |  |        |        |
|------------------|-------|--|--|--|--|--------|--------|
| (1) PASSING WT.  |       |  |  |  |  |        | 5 lbs. |
| (2) RETAINED WT. |       |  |  |  |  | 5 lbs. | PAN    |
| (3)              | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
|                  | ----- |  |  |  |  |        | -----  |
| (4) TOTALS       |       |  |  |  |  |        |        |

Rows (1) & (2) Enter 5 to 7 weight classes to yield approx. 75%, 50%, 30%, and 15% finer points.

Row (3) List weight of each stone. Attach additional sheets if necessary.

Row (4) Add all individual stone weights listed in each column.

## Part 2. Summary Table.

| (5) WEIGHT CLASSES                |                                    | (6)<br>TOTAL WEIGHT<br>EACH CLASS<br>(lbs.) | (7)<br>CUMMULATIVE<br>WEIGHT PASSING<br>(lbs.) | (8)<br>TOTAL PERCENT<br>PASSING<br>(%) |
|-----------------------------------|------------------------------------|---|--|--|
| PASSING<br>(stone wt.<br>in lbs.) | RETAINED<br>(stone wt.<br>in lbs.) |   |  |  |
|                                   |                                    |   |  |  |
|                                   |                                    |   |  |  |
|                                   |                                    |   |  |  |
|                                   |                                    |   |  |  |
|                                   |                                    |   |  |  |
|                                   | 5 lbs.                             |   |  |  |
| 5 lbs.                            | PAN                                |   |  |  |
| SAMPLE TOTAL                      |                                    |   | -----  | -----                                  |

Column (5) Enter same weight classes used in Rows (1) and (2).

Column (6) Enter weights of material from Row (4)

Column (7) Add column (6) from bottom up to get cumulative weight passing.

Column (8) Divide column (7) by sample total to get total percent passing.

# WORK SHEET FOR GRADATION ANALYSIS OF RIPRAP METHOD B

|                         |               |
|-------------------------|---------------|
| Project Name:           | Date:         |
|                         |               |
| Riprap Type:            | Test No.      |
| Source, Quarry, or Pit: |               |
| Sample Location:        | Test Made By: |

Part 1. Separate rock into 5 to 7 piles, ordered by size. The largest pile should contain 2 to 5 stones. Intermediate piles between the largest stones and those smaller than 5 pounds should be approximately equal in total weight. Separate all stones before weighing.

## Part 2. Summary Table.

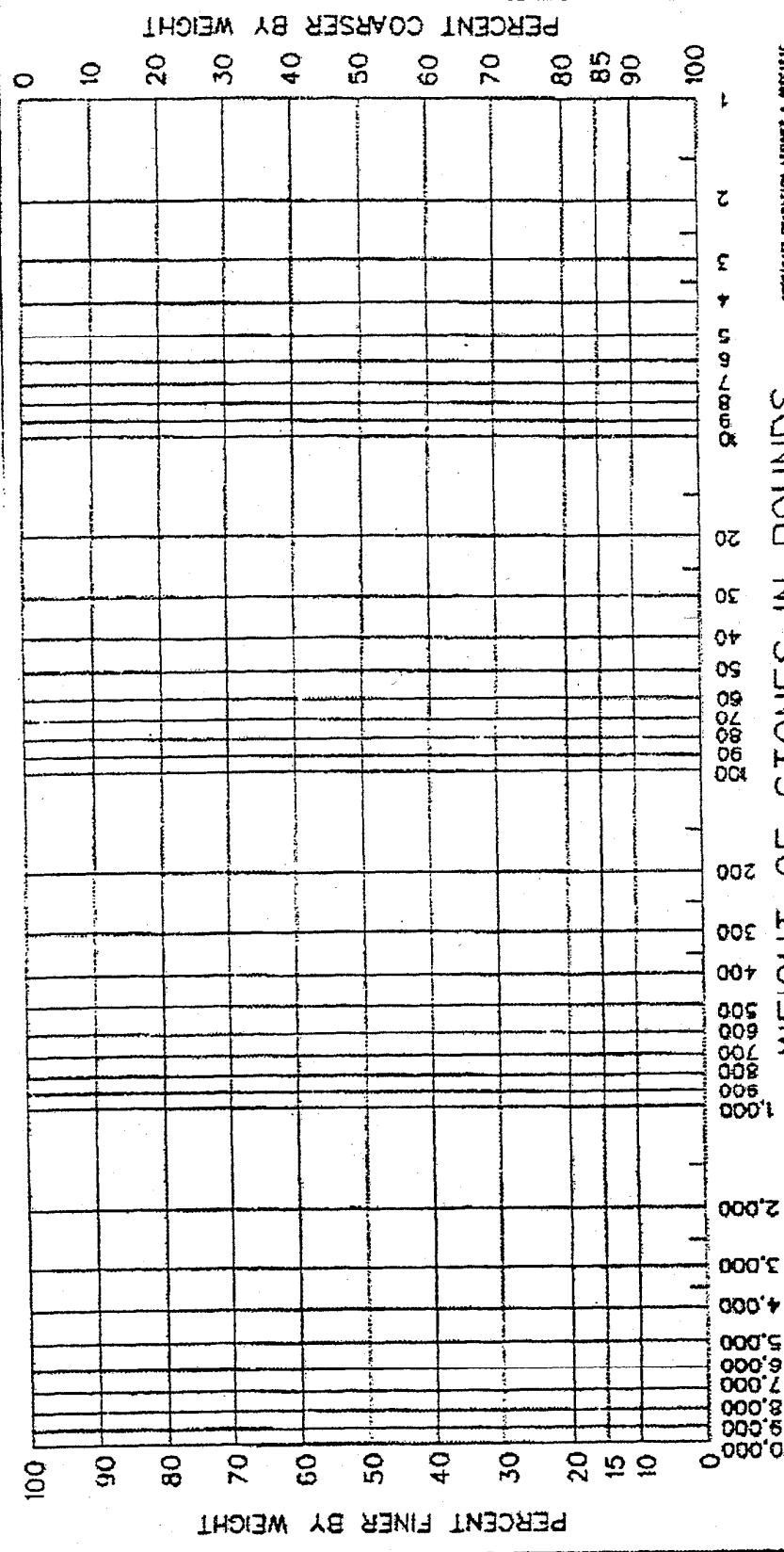
| (1) WEIGHT CLASSES                |                                    | (2)                                  | (3)                                     | (4)                             |
|-----------------------------------|------------------------------------|--------------------------------------|---|---------------------------------|
| PASSING<br>(stone wt.<br>in lbs.) | RETAINED<br>(stone wt.<br>in lbs.) | TOTAL WEIGHT<br>EACH CLASS<br>(lbs.) | CUMMULATIVE<br>WEIGHT PASSING<br>(lbs.) | TOTAL PERCENT<br>PASSING<br>(%) |
|                                   |                                    |                                      |   |                                 |
|                                   |                                    |                                      |   |                                 |
|                                   |                                    |                                      |   |                                 |
|                                   |                                    |                                      |   |                                 |
|                                   |                                    |                                      |   |                                 |
|                                   | 5 lbs.                             |                                      |   |                                 |
| 5 lbs.                            | PAN                                |                                      |   |                                 |
| SAMPLE TOTAL                      |                                    |                                      | -----                                   | -----                           |

Column (1) Weight the smallest and largest stone in each pile. If weight classes overlap, adjust stones as necessary and repeat.

Column (2) Weigh the total amount of rock in each pile and record.

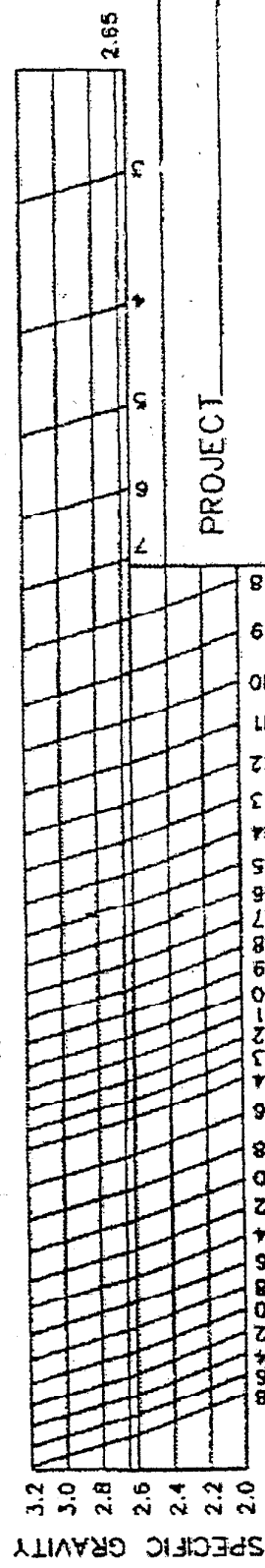
Column (3) Add column (2) from bottom up to get cumulative weight passing.

Column (4) Divide column (3) by sample total to get total percent passing.



SPECIFIED GRADATION ASSUMES A SPECIFIC GRAVITY OF STONE EQUAL TO 2.65

WEIGHT OF STONES IN POUNDS  
(ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE)



PROJECT \_\_\_\_\_

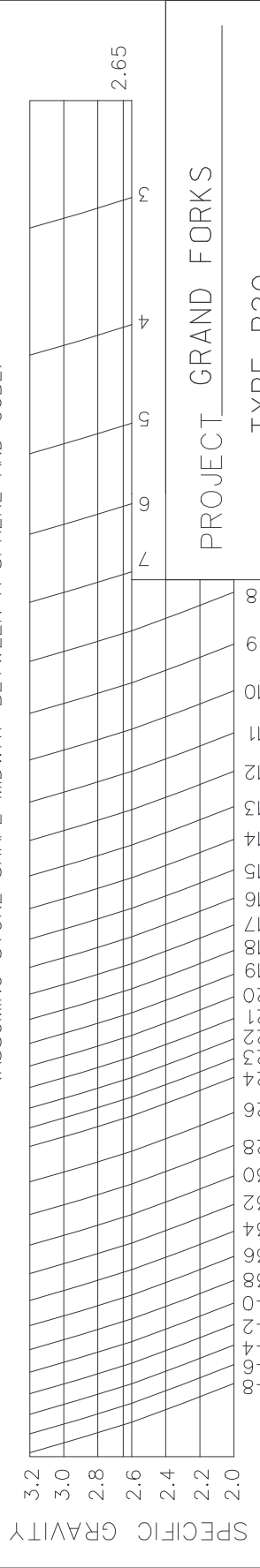
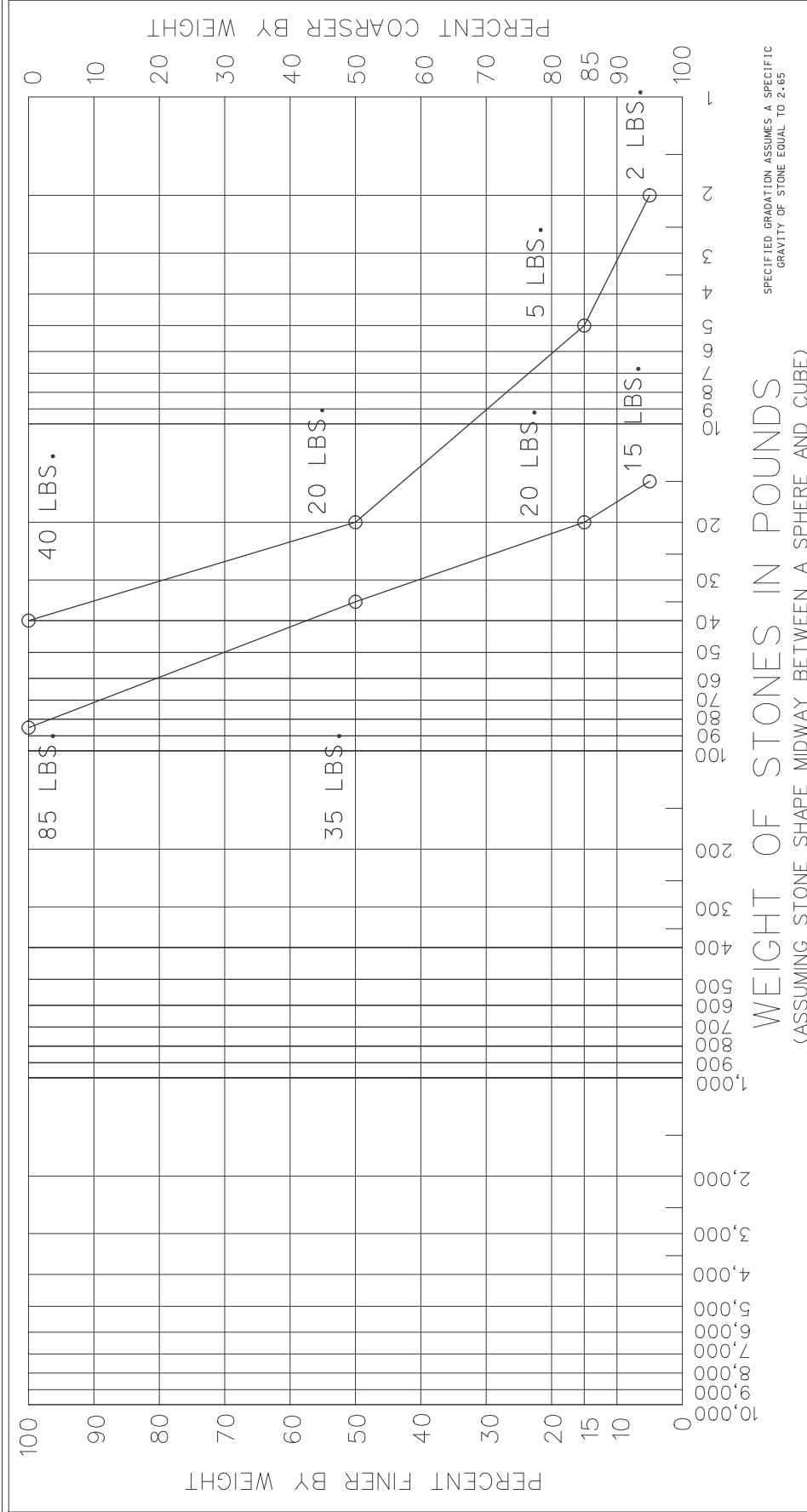
AREA \_\_\_\_\_

DATE \_\_\_\_\_

SPECIFIC GRAVITY OF STONE =

RIPRAP/ROCKFILL GRADATION CURVE





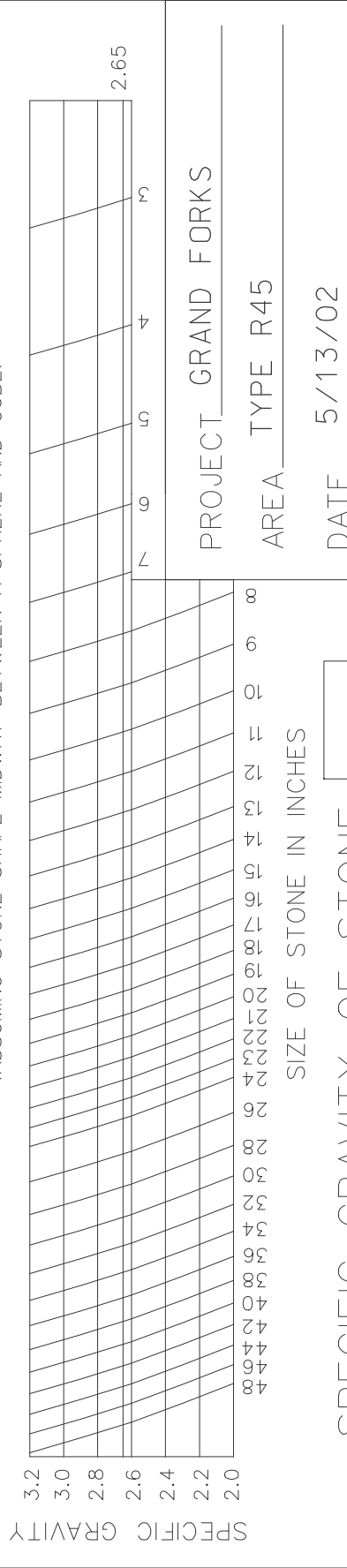
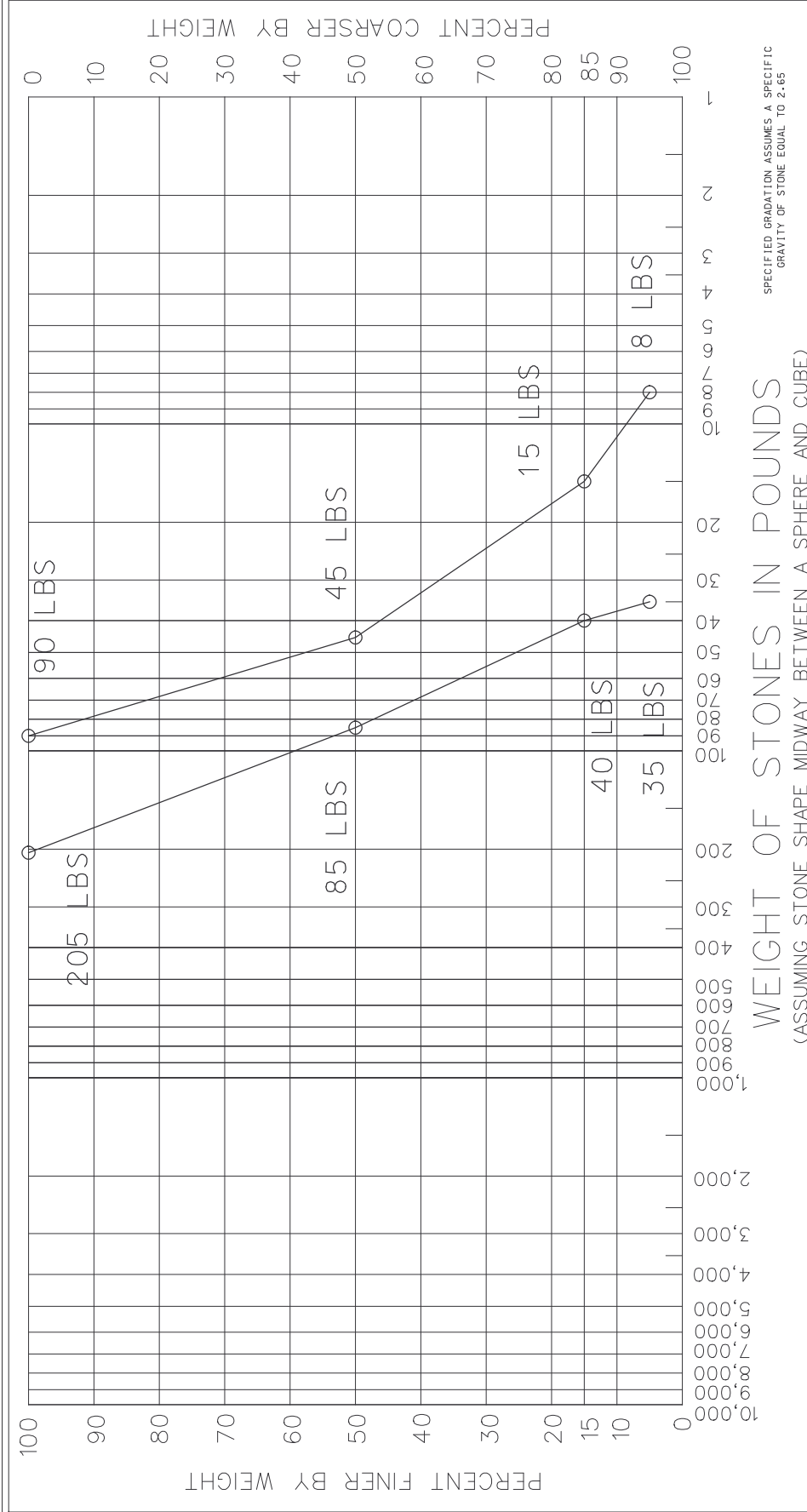
PROJECT GRAND FORKS

AREA TYPE R20

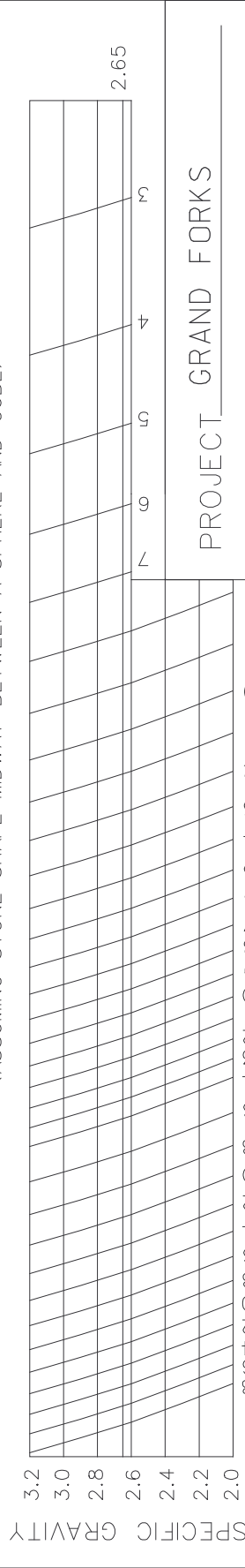
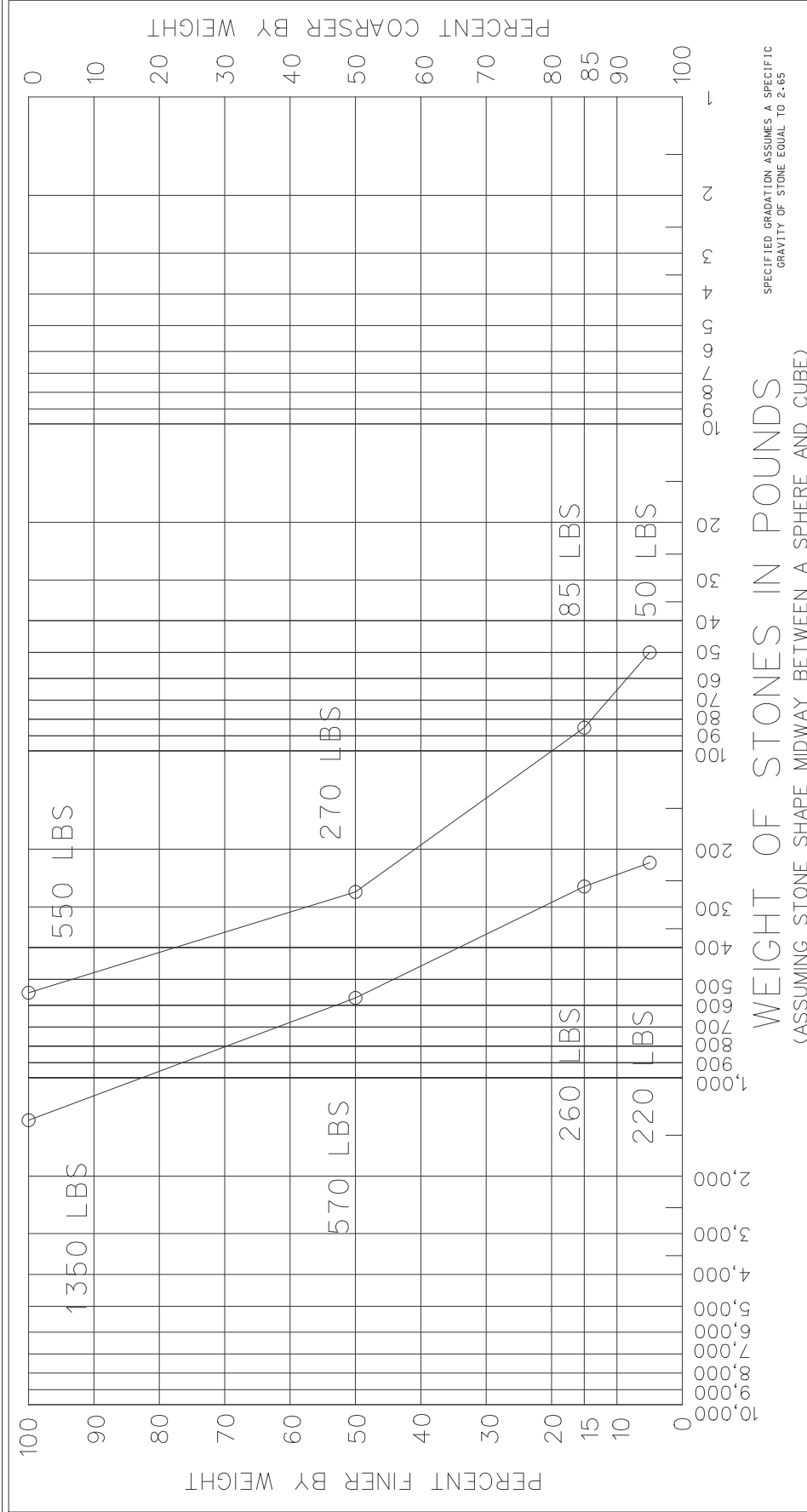
DATE 5/13/02

SPECIFIC GRAVITY OF STONE = 2.65

RIPRAP/ROCKFILL GRADATION CURVE



SPECIFIC GRAVITY OF STONE = 2.65



PROJECT GRAND FORKS

AREA TYPE R270

DATE 5/13/02

SPECIFIC GRAVITY OF STONE = 2.65

RIPRAP/ROCKFILL GRADATION CURVE

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02464

METAL SHEET PILING

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, STORAGE AND HANDLING

PART 2 PRODUCTS

- 2.1 METAL SHEET PILING
- 2.2 APPURTENANT METAL MATERIALS
- 2.3 TESTS, INSPECTIONS, AND VERIFICATIONS
  - 2.3.1 Materials Tests

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Pile Driving Equipment
    - 3.1.1.1 Driving Hammers
  - 3.1.2 Placing and Driving
    - 3.1.2.1 Placing
    - 3.1.2.2 Driving
  - 3.1.3 Cutting-Off and Splicing
  - 3.1.4 Inspection of Driven Piling
  - 3.1.5 Pulling and Redriving

-- End of Section Table of Contents --



SECTION 02464

METAL SHEET PILING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 6/A 6M (2000) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

ASTM A 328/A 328M (2000) Steel Sheet Piling

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Pile Driving Equipment; GA

Complete descriptions of sheet piling driving equipment including hammers, extractors, protection caps and other installation appurtenances shall be submitted for approval prior to commencement of work.

Pulling and Redriving; GA

The proposed method of pulling sheet piling shall be submitted and approved prior to pulling any piling.

SD-04 Drawings

Metal Sheet Piling; GA

Detail drawings for sheet piling including fabricated sections shall show complete piling dimensions and details, driving sequence and location of installed piling. Detail drawings shall include details and dimensions of templates and other temporary guide structures for installing piling. Detail drawings shall provide details of the method of handling piling to prevent permanent deflection, distortion or damage to piling interlocks.

Driving; GA

Records of the sheet piling driving operations shall be

submitted after driving is completed. These records shall provide a system of identification which shows the disposition of approved piling in the work, driving equipment performance data, piling penetration rate data, piling dimensions and top and bottom elevations of installed piling. The format for driving records shall be as directed.

#### SD-09 Reports

##### Materials Tests; GA

Certified materials tests reports showing that sheet piling and appurtenant metal materials meet the specified requirements shall be submitted for each shipment and identified with specific lots prior to installing materials. Material test reports shall meet the requirements of ASTM A 6/A 6M.

### 1.3 DELIVERY, STORAGE AND HANDLING

Materials delivered to the site shall be new and undamaged and shall be accompanied by certified test reports. The manufacturer's logo and mill identification mark shall be provided on the sheet piling as required by the referenced specifications. Sheet piling shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks. Storage of sheet piling should also facilitate required inspection activities. Sheet piling over 80 feet in length shall be handled using a minimum of two pickup points.

## PART 2 PRODUCTS

### 2.1 METAL SHEET PILING

Metal sheet piling shall be hot-rolled steel sections conforming to ASTM A 328/A 328M or cold-formed steel sections formed from hot-rolled steel meeting the chemical and mechanical requirements of ASTM A 328/A 328M. The interlocks of sheet piling shall be free-sliding, provide a swing angle suitable for the intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed. Sheet piling including special fabricated sections shall be full-length sections of the dimensions shown. Fabricated sections shall conform to the requirement and the piling manufacturer's recommendations for fabricated sections. Fabricated tees, wyes and cross pieces shall be fabricated of piling sections with a minimum web thickness of 1/2 inch. Sheet piling shall be provided with standard pulling holes.

### 2.2 APPURTENANT METAL MATERIALS

Metal plates, shapes, bolts, nuts, rivets and other appurtenant fabrication and installation materials shall conform to manufacturer's standards and to the requirements specified in the respective sheet piling standards.

### 2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

Requirements for material tests, workmanship and other measures for quality assurance shall meet all applicable standards.

#### 2.3.1 Materials Tests

Materials tests shall conform to the following requirements. Sheet piling

and appurtenant materials shall be tested and certified by the manufacturer to meet the specified chemical, mechanical and section property requirements prior to delivery to the site. Testing of sheet piling for mechanical properties shall be performed after the completion of all rolling and forming operations. Testing of sheet piling shall meet the requirements of ASTM A 6/A 6M.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Pile Driving Equipment

Pile driving equipment shall conform to the following requirements.

##### 3.1.1.1 Driving Hammers

Hammers shall be steam, air, or diesel drop, single-acting, double-acting, differential-acting, or vibratory type. The driving energy of the hammers shall be as recommended by the manufacturer for the piling weights and subsurface materials to be encountered.

##### 3.1.2 Placing and Driving

##### 3.1.2.1 Placing

Any excavation required within the area where sheet pilings are to be installed shall be completed prior to placing sheet pilings. Pilings shall be carefully located as shown. Pilings shall be placed plumb with out-of-plumbness not exceeding 1/8 inch per foot of length and true to line. Temporary wales, templates, master pilings current deflectors or guide structures shall be provided to insure that the pilings are placed and driven to the correct alignment. At least two templates shall be used in placing each piling and the maximum spacing of templates shall not exceed 20 feet. Pilings properly placed and driven shall be interlocked throughout their length with adjacent pilings to form a continuous diaphragm throughout the length or run of piling wall.

##### 3.1.2.2 Driving

Prior to driving pilings in water a horizontal line shall be painted on both sides of each piling at a fixed distance from the bottom so that it shall be visible above the water line after installation. This line shall indicate the profile of the bottom elevation of installed pilings and potential problem areas can be identified by abrupt changes in its elevation. Pilings shall be driven with the proper size hammer and by approved methods so as not to subject the pilings to damage and to ensure proper interlocking throughout their lengths. Driving hammers shall be maintained in proper alignment during driving operations by use of leads or guides attached to the hammer. Caution shall be taken in the sustained use of vibratory hammers when a hard driving condition is encountered to avoid interlock-melt or damages. The use of vibratory hammers should be discontinued and impact hammers employed when the penetration rate due to vibratory loading is one foot or less per minute. A protecting cap shall be employed in driving when using impact hammers to prevent damage to the tops of pilings. Pilings damaged during driving or driven out of interlock shall be removed and replaced at the Contractor's expense. Pilings shall be driven without the aid of a water jet unless otherwise authorized. Adequate precautions shall be taken to insure that pilings are driven

plumb. If at any time the forward or leading edge of the piling wall is found to be out-of-plumb in the plane of the wall the piling being driven shall be driven to the required depth and tapered pilings shall be provided and driven to interlock with the out-of-plumb leading edge or other approved corrective measures shall be taken to insure the plumbness of succeeding pilings. The maximum permissible taper for any tapered piling shall be 1/8 inch per foot of length. Pilings in each run or continuous length of piling wall shall be driven alternately in increments of depth to the required depth or elevation. No piling shall be driven to a lower elevation than those behind it in the same run except when the pilings behind it cannot be driven deeper. If the piling next to the one being driven tends to follow below final elevation it may be pinned to the next adjacent piling. If obstructions restrict driving a piling to the specified penetration the obstructions shall be removed or penetrated with a chisel beam. If the Contractor demonstrates that removal or penetration is impractical the Contractor shall make changes in the design alignment of the piling structure as directed to insure the adequacy and stability of the structure. Pilings shall be driven to depths shown and shall extend up to the elevation indicated for the top of pilings. A tolerance of 1 inch above the indicated top elevation will be permitted. Pilings shall not be driven within 100 feet of concrete less than 7 days old.

#### 3.1.3 Cutting-Off and Splicing

Pilings driven to refusal or to the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Pilings driven below the required top elevation and pilings damaged by driving and cut off to permit further driving shall be extended as required to reach the top elevation by splicing when directed at no additional cost to the Government. Pilings adjoining spliced pilings shall be full length unless otherwise approved. Ends of pilings to be spliced shall be squared before splicing to eliminate dips or camber. Pilings shall be spliced together with concentric alignment of the interlocks so that there are no discontinuities, dips or camber at the abutting interlocks. Spliced pilings shall be free sliding and able to obtain the maximum swing with contiguous pilings. The tops of pilings excessively battered during driving shall be trimmed when directed at no cost to the Government. Piling cut-offs shall become the property of the Contractor and shall be removed from the site. The Contractor shall cut holes in pilings for bolts, rods, drains or utilities as shown or as directed. All cutting shall be done in a neat and workmanlike manner. A straight edge shall be used in cuts made by burning to avoid abrupt nicks. Bolt holes in steel piling shall be drilled or may be burned and reamed by approved methods which will not damage the surrounding metal. Holes other than bolt holes shall be reasonably smooth and the proper size for rods and other items to be inserted.

#### 3.1.4 Inspection of Driven Piling

The Contractor shall inspect the interlocked joints of driven pilings extending above ground. Pilings found to be out of interlock shall be removed and replaced at the Contractor's expense.

#### 3.1.5 Pulling and Redriving

In the pulling and redriving of piles as directed, the Contractor shall pull selected pilings after driving to determine the condition of the underground portions of pilings. Any piling so pulled and found to be

damaged to the extent that its usefulness in the structure is impaired shall be removed and replaced. Pilings pulled and found to be in satisfactory condition shall be redriven when directed.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02468

CYLINDER PILES

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY AND STORAGE
- 1.4 QUALITY ASSURANCE
  - 1.4.1 Survey of Cylinder Pile Locations

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Concrete Work
    - 2.1.1.1 Strength
    - 2.1.1.2 Coarse Aggregate
    - 2.1.1.3 Portland Cement
    - 2.1.1.4 Pozzolan (Fly Ash)
    - 2.1.1.5 Air Entraining Admixture
    - 2.1.1.6 Silica Fume
    - 2.1.1.7 Reinforcing Steel
    - 2.1.1.8 Survey Monument
- 2.2 CYLINDER PILE DRILLING EQUIPMENT

PART 3 EXECUTION

- 3.1 SUPERVISION, INSPECTION, AND SAFETY
  - 3.1.1 Contractor Supervision
  - 3.1.2 Government Inspection
  - 3.1.3 Life Line
  - 3.1.4 Ventilation
  - 3.1.5 Communications
  - 3.1.6 Protection of Openings
  - 3.1.7 OSHA Regulations
  - 3.1.8 Laws and Regulations
- 3.2 PREPARATION
- 3.3 INSTALLATION
  - 3.3.1 Excavation
  - 3.3.2 Protection and Casings
    - 3.3.2.1 Drilling Obstructions
    - 3.3.2.2 Cleaning Casings
    - 3.3.2.3 Temporary Casings
    - 3.3.2.4 Water Removal and Disturbed Subbase
  - 3.3.3 Slurry Method
    - 3.3.3.1 Slurry
    - 3.3.3.2 Slurry in Excavation at Time of Concrete Placement
  - 3.3.4 Filling Procedure
    - 3.3.4.1 Concrete Pump

Grand Forks Phase 2 Levees

- 3.3.4.2 Volume of Concrete
- 3.3.4.3 Procedure for Unintended Cold Joints
- 3.3.4.4 Concrete Vibration
- 3.3.5 Reinforcement
- 3.3.6 Survey Monuments
- 3.4 TOLERANCES
  - 3.4.1 Alignment
  - 3.4.2 Cross Sections of Shafts
  - 3.4.3 Top Location of Cylinder Piles
  - 3.4.4 Plumbness of Cylinder Pile
  - 3.4.5 The Center of the Cylinder Pile
- 3.5 DEMONSTRATION/TEST CYLINDER PILE
- 3.6 TESTING
- 3.7 INCLINOMETER CASING
- 3.8 RECORDS

-- End of Section Table of Contents --

SECTION 02468

CYLINDER PILES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 211.1 (1991) Selecting Proportions for Normal, Heavyweight, and Mass Concrete

AMERICAN PETROLEUM INSTITUTE (API)

API RP 13B-1 (1977) Field Testing Water-Based Drilling Fluids

API RP 13B-2 (1998) Field Testing Oil-Based Drilling Fluids

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 615/A 615M (1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM C 150 (1999a) Portland Cement

ASTM C 1240 (2000) Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar and Grout

ASTM D 2487 (1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Mixture Proportions; GA

Submit results of trial mixture design studies as detailed in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE and modified herein.

SD-04 Drawings



Survey of cylinder pile locations; FIO

Construction and Installation Plan; GA

A construction and installation plan shall be submitted 30 days prior to the beginning of construction and shall indicate the drilling equipment to be used, equipment set-up location, hole drilling and concreting sequence, methods and materials proposed for excavation, methods of maintaining sidewall stability during drilling, details of slurry (if any) including proposed methods to mix, circulate, desand, test and documentation of test results, detailed procedures for casing withdrawal (if any), provisions for dewatering of excavation, method and equipment for placing reinforcing steel and concrete, method to be used to clean the shaft excavation, details of centering devices and spacing, and details of the tremie tube to be used.

SD-18 Records

Cylinder pile records; FIO

Submit detailed records for each cylinder pile as specified in paragraph entitled "Records."

Qualifications; FIO

Qualifications of the cylinder pile contractor shall show that it has been engaged in the successful installation of drilled concrete caissons for at least 3 years. Qualifications shall include a brief description of similar projects completed or underway and shall include client references.

### 1.3 DELIVERY AND STORAGE

Deliver temporary casings and appurtenant equipment to the job site in an undamaged and ready to place condition. Delivery of concrete shall be in accordance with requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

### 1.4 QUALITY ASSURANCE

#### 1.4.1 Survey of Cylinder Pile Locations

Submit a certified survey meeting the requirements specified herein.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Concrete Work

Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE, as modified herein:

##### 2.1.1.1 Strength

Concrete strength shall be 4,000 psi at 28 days. High-early strength cement shall not be permitted. The required average strength  $f'_{cr}$  can be determined based on  $f'_{cr} = f'_c + 500$  psi, as described in Section 03300

CAST-IN-PLACE STRUCTURAL CONCRETE paragraph AVERAGE COMPRESSIVE STRENGTH REQUIRED FOR MIXTURES. The maximum ratio of water to cementitious materials shall be 0.40 as described in ACI 211.1. Concrete temperature as delivered on site shall not exceed 80 degrees F.

2.1.1.1.2 Coarse Aggregate

Maximum size of coarse aggregate shall be 1-1/2 inches. Coarse aggregate shall be well-graded as defined in ASTM D 2487 and not be susceptible to ASR.

2.1.1.1.3 Portland Cement

ASTM C 150, Type II cement.

2.1.1.1.4 Pozzolan (Fly Ash)

Use same requirements listed in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE paragraph POZZOLAN (FLY ASH); only Class F fly ash permitted.

2.1.1.1.5 Air Entraining Admixture

Use same requirements listed in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE paragraph AIR ENTRAINMENT.

2.1.1.1.6 Silica Fume

Conform to ASTM C 1240. Obtain silica fume for total project from single source. Mixture shall contain 5 percent to 7 percent by weight replacement of portland cement with silica fume.

2.1.1.1.7 Reinforcing Steel

ASTM A 615/A 615M Grade 60.

2.1.1.1.8 Survey Monument

Survey monuments shall be made of brass caps or lead plugs.

2.2 CYLINDER PILE DRILLING EQUIPMENT

Cylinder pile drilling equipment shall have minimum torque capacity and downward force capacity suitable for the site conditions.

PART 3 EXECUTION

3.1 SUPERVISION, INSPECTION, AND SAFETY

3.1.1 Contractor Supervision

The Contractor shall provide for the supervision of all phases of cylinder pile construction. Supervision shall be the Contractor's responsibility. Each cylinder pile excavation shall be checked by the Contractor for its depth, water removal, cleanup, workmanship, and for all tolerance requirements before any concrete is placed.

3.1.2 Government Inspection

The Contracting Officer may, at his option, inspect each or select cylinder

pile excavations. Concrete shall not be placed until the excavation has been inspected by the Contracting Officer or such inspection has been waived by the Contracting Officer. The Contractor shall furnish the Contracting Officer all necessary equipment, labor, and safety gear required for proper and safe inspection of cylinder pile excavations.

#### 3.1.3 Life Line

Each person entering a cylinder pile excavation for any reason shall be provided with a life line rigged so that the person can be immediately hoisted out of the excavation in an emergency. The life line shall be suitable for instant rescue, securely fastened to a shoulder harness, and separated from any line used to remove excavated materials. No person shall be lowered into a cylinder pile excavation prior to casing the shaft. Alternate means of protecting workers and inspectors may be proposed by the Contractor in lieu of full length temporary casing, but the Contracting Officer may refuse to accept such alternate means at his sole discretion.

#### 3.1.4 Ventilation

Each cylinder pile excavation shall be provided with a ventilating device of sufficient capacity to assure a safe and healthy atmosphere before persons are permitted to enter the excavation. Contractor shall verify that no harmful gas is present in the excavation prior to personnel entering the excavation. Self-contained breathing apparatus may be used.

#### 3.1.5 Communications

Contractor shall provide means to maintain continuous communication between workers or inspectors entering the cylinder pile excavation and an appointed safety monitor on the surface any time personnel enters a cylinder pile excavation for any reason.

#### 3.1.6 Protection of Openings

The top of any cylinder pile excavation shall be covered when excavation work is discontinued or finished and the excavation is left open for any reason. The cover should be substantial and strong enough to prevent any person from falling into the excavation.

#### 3.1.7 OSHA Regulations

The Contractor is responsible for making sure all OSHA regulations are met prior to personnel entering the cylinder pile excavation for any reason.

#### 3.1.8 Laws and Regulations

The safety provisions of this section should be regarded as a minimum. Contractor shall observe all laws and regulations governing the work, which may require stricter measures to be implemented, including those of the U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM385-1-1 October 1992), and the Occupational Safety and Health Administration.

### 3.2 PREPARATION

Prior to drilling, the Contractor shall stake the cylinder pile wall alignment and the centerline of each cylinder pile and determine the ground elevation at the centerline of each cylinder pile. The Contractor shall

employ a registered surveyor or engineer for this work. A certified copy of the survey shall be submitted to the Contracting Officer. The Contracting Officer will inspect the staked locations and alignment and may adjust the location of the cylinder piles to accommodate field conditions. The Contractor shall not begin excavation until the staked locations have been approved by the Contracting Officer.

Contractor shall locate existing underground utilities and construction to determine potential conflicts in the work. Any potential interference shall be brought immediately to the attention of the Contracting Officer for resolution. Contracting Officer may relocate the cylinder piles or may request relocation of the utility to resolve the potential interference.

### 3.3 INSTALLATION

#### 3.3.1 Excavation

Drill cylinder piles to depths and dimensions shown. Clean bottoms of cylinder piles of loose, soft, or disturbed materials and level. Dispose of excavated material off site. Excavations made below indicated depths, without specific direction by the Contracting Officer, shall be filled with concrete. Where, in the opinion of the Contracting Officer, materials are encountered at the indicated depths that would result in unsatisfactory construction, the excavation shall be extended as directed by the Contracting Officer and an adjustment in the contract requirements will be made.

#### 3.3.2 Protection and Casings

In drilling cylinder piles, protect surrounding soil and excavated walls against cave-ins, displacement of the surrounding earth, and retention of ground water by means of temporary steel casings, slurry method, or other means approved by the Contracting Officer. Tamping and/or pounding the casing into the ground will not be allowed. Casings shall not be driven within 20 feet of concrete placed within last 24 hours. Withdraw temporary steel casings, as concrete is placed, maintaining sufficient head of concrete within the casing (5 feet minimum above bottom of casing) to prevent extraneous material from falling in from the sides and mixing with the concrete. Casings may be jerked upward a maximum of 4 inches to break the bottom seal but thereafter removed with a smooth, continuous motion. All voids surrounding the casing shall be filled with concrete extruded from the bottom of the casing as it is being raised, with all free water surrounding the casing being forced to the surface ahead of the rising concrete. Provide venting if necessary to ensure removal of water around the casing as the concrete level rises and the casing is being removed.

##### 3.3.2.1 Drilling Obstructions

Overburden may contain cobbles and boulders. Drilling obstructions are defined as a cobble or boulder or any other natural or man-made object present in the overburden causing refusal to drilling such that drilling cannot be advanced by the use of normal drilling techniques and tools appropriate for drilling the overburden expected to be encountered at the site, therefore requiring the use of special tools or hand excavation.

Boulders and other obstructions to drilling that interfere with proper excavation, reinforcement placement, or concrete placement must be removed. Any such obstructions identified by the Contractor shall be brought to the Contracting Officer's attention prior to removal. Contractor shall provide

evidence to the Contracting Officer that the obstruction cannot be removed by normal techniques, and the Contracting Officer shall make a determination as to whether or not the obstruction requires removal. The Contractor's proposed method of obstruction removal shall be submitted to the Contracting Officer for approval.

#### 3.3.2.2 Cleaning Casings

Clean inside of steel casings thoroughly and oil before reuse.

#### 3.3.2.3 Temporary Casings

The temporary casing shall be in place from the cylinder pile top to the ground surface until the concrete has set if the elevation of the top of the cylinder pile is below the adjacent ground surface.

#### 3.3.2.4 Water Removal and Disturbed Subbase

Continuously remove water that flows into the excavations and the excavation bottom prior to concrete placement. The maximum permissible water depth will be 2 inches at the start of concrete placement. If severe water conditions (greater than 1/4 inch rise per minute) make it impossible or impractical to dewater the excavation, deepen the excavation to undisturbed material and place concrete using underwater tremie after water movement has stabilized.

#### 3.3.3 Slurry Method

Use the slurry construction method where it is impractical to provide a dry excavation for placement of the cylinder pile concrete. The slurry construction method consists of drilling the shaft excavation below the water table, keeping the shaft filled with fluid (mineral slurry, natural slurry or water), desanding and cleaning the mineral slurry and final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other approved devices and placing the shaft concrete (with a tremie or concrete pump extending to the shaft bottom) which displaces the water or slurry during concreting of the shaft excavation. Provide temporary surface casings to aid shaft alignment and position and to prevent sloughing of the top of the shaft except when the Contracting Officer declares that the surface casing is not required.

##### 3.3.3.1 Slurry

When slurry is used in an excavation, use only mineral slurry of processed attapulgite or bentonite clays. The Contracting Officer will not allow polymer slurries. Use slurry having a mineral grain size such that it will remain in suspension and having sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. Use a percentage and specific gravity of the material to make the suspension sufficient to maintain the stability of the excavation and to allow proper placement of concrete. Ensure that the material used to make the slurry is not detrimental to concrete or surrounding ground strata. During construction, maintain the level of the slurry at a height sufficient to prevent caving of the hole. In the event of a sudden significant loss of slurry such that the slurry level cannot practically be maintained by adding slurry to the hole, delay the construction of that cylinder pile until an alternate construction procedure has been approved.

Thoroughly premix the mineral slurry with clean fresh water prior to

introduction into the shaft excavation. Ensure that the percentage of mineral admixture used to make the suspension is such as to maintain the stability of the shaft excavation. Provide adequate desanding equipment. Take the steps necessary to prevent the slurry from "setting up" in the shaft, including but not limited to agitation, circulation, and/or adjusting the composition and properties of the slurry. Provide suitable offsite disposal areas and dispose of all waste slurry in a manner meeting all requirements pertaining to pollution.

Provide a qualified professional soil testing laboratory approved by the Contracting Officer to perform control tests using suitable apparatus on the mineral slurry mixture to determine the following parameters:

(a) Freshly mixed mineral slurry: Measure the density of the freshly mixed mineral slurry regularly as a check on the quality of the suspension being formed using a measuring device calibrated to read within  $\pm 0.5$  lb/ft<sup>3</sup>.

(b) Mineral slurry supplied to the drilled shaft excavation: Perform the following tests in accordance with the procedures described in API RP 13B-1 and API RP 13B-2 and ensure the results are within the ranges stated in the table below:

| <u>Item to be measured</u> | <u>Range of Results at 68°F</u>                     |
|----------------------------|---|
| Density                    | 65 to 73 pounds/ft <sup>3</sup><br>(in fresh water) |
| Viscosity                  | 28 to 40 seconds                                    |
| PH                         | 8 to 11   |
| Sand Content               | 4% or less  |

The Contractor may adjust the limits in the above table(s) when field conditions warrant as successfully demonstrated in a Test Hole or with other methods approved by the Contracting Officer. The Contracting Officer must approve all changes in writing before the Contractor can continue to use them.

Perform tests to determine density, viscosity, and pH value to establish a consistent working pattern, taking into account the mixing process and blending of freshly mixed mineral slurry and previously used mineral slurry. Perform a minimum of four sets of tests to determine density, viscosity, and pH value during the first 8 hours mineral slurry is in use.

When the results show consistent behavior, discontinue the tests for pH value, and only carry out tests to determine density and viscosity during each four hours mineral slurry is in use. If the consistent working pattern changes, reintroduce the additional tests for pH value for the time required to establish consistency of the test values within the required parameters.

(c) Furnish reports of all mineral slurry tests required above, signed and sealed by a Registered Engineer, representing the soil testing laboratory to the Contracting Officer on completion of each cylinder pile.

(d) The Government may perform comparison tests as determined necessary during the mineral slurry operations.

During construction, maintain the level of mineral slurry in the shaft

excavation within the excavation and at a level not less than 4 feet above the highest expected piezometric water pressure along the depth of a shaft.

At any time the slurry construction method of stabilizing excavations fails, in the opinion of the Contracting Officer, to produce the desired final result, discontinue this method of construction, and propose modifications in procedure or alternate means of construction for approval.

#### 3.3.3.2 Slurry in Excavation at Time of Concrete Placement

Prior to placing concrete in any shaft excavation, ensure that heavily contaminated suspensions, which could impair the free flow of concrete from the tremie pipe, have not accumulated in the bottom of the shaft. Take samples of the fluid in the shaft from the base of the shaft and at intervals not exceeding 10 feet up the shaft, using an approved sampling tool. Ensure that the density of the fluid in the shaft excavation prior to concreting is less than 75 lb/cu ft. Take whatever action is necessary to modify the fluid in the shaft excavation prior to placing the concrete to bring the fluid within the specification requirements.

When using mineral slurry, the applicable density test method and reporting requirements described herein apply to tests of slurry in the shaft prior to placing the concrete. Such tests shall be performed by an approved soil testing laboratory engaged by the Contractor in the presence of the Contracting Officer. The Government may also perform comparison tests. Provide equipment for such comparison tests when requested by the Contracting Officer.

#### 3.3.4 Filling Procedure

Prior to placing concrete, inspect cylinder pile excavation to ensure that deleterious material or detrimental conditions are not present in the excavation. Concrete shall be placed within 3 hours after completing excavation. Place concrete continuously by methods that ensure against segregation and dislodging of excavation sidewalls and completely fill the shaft. Place concrete by pumping or tremie. For concrete placed by pumping or tremie, the discharge shall be kept a minimum of 5 feet below the fresh concrete surface during placement.

The tremie pipe shall be smooth and thoroughly cleaned of any hardened concrete, rust, and all other contaminants. The tremie pipe shall be marked to allow determination of depth to the mouth of the tremie. Joints between sections of tremie pipe shall be gasketed and bolted to be watertight under placement conditions. Instead of bolted joints, welded joints may be used if a smooth finish is maintained on the inside of the tremie pipe at the weld location.

A crane or other lifting device shall be available to remove the tremie from the water for resealing or horizontal relocation.

Placement of underwater concrete shall be a continuous operation. If an interruption in placement occurs, the interruption shall not exceed 30 minutes without removal of the tremie and restarting the concrete placement according to the paragraph below. An interruption in concrete placement shall not exceed the time for initial set of the concrete. If the concrete attains the initial set before the concrete placement is completed, concrete placement shall cease and the concrete in the shaft shall be rejected and removed from the shaft.

Starting/Restarting of the concrete placement by tremie shall begin by sealing the bottom of the tremie with a watertight seal before placing the tremie into the slurry mix. The watertight seal shall prevent water from entering the tremie, yet will be dislodged when concrete flow is initiated. The empty tremie pipe shall be sufficiently heavy to be negatively buoyant when empty. The tremie pipe shall be sealed, lowered to the bottom of the shaft, and completely filled with concrete. Fill the tremie slowly to avoid entrapped air and bridging. When full, the tremie shall be slowly lifted 6 inches off the bottom to start concrete flow. The concrete supply shall be continuous until soundings indicate the tremie has the required embedment. After being dislodged, the sealing device shall either remain on the bottom or be retrieved by the Contractor.

The mouth of the tremie shall always remain embedded in the fresh concrete unless the tremie is being completely removed from the slurry mix. At no time shall the concrete be allowed to fall through slurry.

All vertical movements of the tremie shall be made slowly and shall be carefully controlled to prevent loss of seal. If loss of seal occurs, placement through that tremie shall be halted immediately. The tremie shall be removed, resealed, replaced, and restarted as described above.

#### 3.3.4.1 Concrete Pump

Concrete pumps can be used for underwater concrete placement if surging of the pump line can be controlled to keep the pump line sufficiently embedded into the fresh concrete. If surging of the line cannot be controlled, a concrete pump shall not be used.

The pump line shall be not less than 4 inches in diameter. The portion of the pump line that penetrates the deposited concrete shall be a rigid steel line (pipe).

An approved plug shall be inserted into the pump line, near the pump, in such a way that there is fresh concrete against the plug, with no air or water between the plug and concrete. The plug shall be advanced down the pump line, using pressure from the concrete pump, to the bottom of the shaft.

Placement shall begin with the pump line within 6 inches of the bottom of the shaft. After pumping begins, the pump line shall be kept within 6 inches of the bottom until soundings indicate that the pump line is embedded at least 5 feet into fresh concrete. The end of the pump line may be raised with the rising column of concrete as long as the end of the pump line remains embedded at least 5 feet into the concrete. At no time shall the concrete be allowed to fall through water or the slurry mix.

Placement of concrete shall be a continuous operation. Interruptions of placement shall not exceed 30 minutes or the time of initial set of the concrete whichever is shorter. If the time of initial set is exceeded, the concrete shall be rejected and removed from the shaft.

If the pump line is allowed to come out of, or is removed from, the concrete once placement has begun, placement through the pump line shall be restarted. A watertight seal shall be installed on the end of the pump line. The line shall then be filled with concrete before the pump line is lowered into the water. The pump line shall be filled in such a way as to eliminate air or water in the line. Once filled, the pump line shall be embedded a minimum of 5 feet into the concrete and pumping resumed. The



sealing device shall be retrieved by the Contractor after pumping has been restarted.

#### 3.3.4.2 Volume of Concrete

The theoretical volume of concrete required to fill the cylinder pile shall be computed and compared to the actual volume placed. If the actual volume is appreciably less than the theoretical volume, the cylinder pile may have experienced pinching, collapse of side walls, or contamination of concrete. If a cylinder pile defect is suspected, options include investigation of the as-installed cylinder pile or immediate reinstallation before the concrete sets up. Rejection of an unacceptable cylinder pile will require installation of one or more replacement cylinder piles at no additional cost to the Government.

#### 3.3.4.3 Procedure for Unintended Cold Joints

Every precaution shall be made to cast full-length shafts. However, in the event of an unexpected condition requiring the halt of shaft concrete placement and the development of a cold joint, the following procedure shall be followed to resume work: Bring concrete to a true level surface inside the shaft and form a full width cross key should it become necessary to interrupt placing concrete in any cylinder pile. Prior to placing additional concrete, clean surfaces of laitance and slush with one to one portland cement grout. The grout shall have a water cement ratio not exceeding that of the concrete.

#### 3.3.4.4 Concrete Vibration

Vibrate top 5 feet of concrete after temporary casing has been withdrawn.

#### 3.3.5 Reinforcement

The reinforcing steel cage (consisting of longitudinal bars, ties, cage stiffener bars, spacers, centralizers, access tubes and inclinometer casing) shall be completely assembled and placed as a unit into the excavated shaft. Placement of the reinforcing steel cage shall take place immediately after the shaft excavation is inspected and approved by the Contracting Officer and before concrete placement.

The reinforcing steel cage shall be tied and supported in the shaft so the cage will remain within the specified tolerances. Welding of the reinforcing steel cage will not be allowed. Concrete centralizers or other approved noncorrosive centering devices shall be used within 1 foot of the cage bottom. Centralizers shall also be used at intervals not exceeding 5 feet along the length of the shaft. Each level of centralizers shall be rotated 45 degrees in the horizontal plane relative to the level below. Concrete centralizers shall be constructed of concrete equal in quality and durability to the concrete specified for the shaft. The concrete centralizers shall have the ends beveled to minimize the potential for catching on obstructions during reinforcing steel placement and they shall have a minimum of 2 tie wires cast in the concrete. Wrapping wires around the concrete centralizers to hold them in place is not an acceptable method of attachment. Any type of steel used as centralizers shall be epoxy coated. The reinforcing steel cage shall not be in contact with the bottom of the shaft.

#### 3.3.6 Survey Monuments

Contractor shall install 4 to 6 monuments to be located at the direction of the Contracting Officer. The Contractor shall survey the monuments twice during his contract and the survey shall be tied to a horizontal control with second order, Class 1 accuracy (1 part in 50,000).

### 3.4 TOLERANCES

#### 3.4.1 Alignment

Cylinder piles out of center or plumb beyond the tolerance specified shall be corrected to comply with the tolerances and the Contractor shall bear any cost of correction. Method of correction shall be approved by the Contracting Officer.

#### 3.4.2 Cross Sections of Shafts

Shall not be less than design dimensions.

#### 3.4.3 Top Location of Cylinder Piles

Install with top location deviating not more than 3 inches from centerline locations.

#### 3.4.4 Plumbness of Cylinder Pile

Install plumb within a maximum of 1 1/2 inches for the first 10 feet and 1/2 inch for each 10 feet of additional depth.

#### 3.4.5 The Center of the Cylinder Pile

Shall be established after construction is completed and the center marked by a suitable permanent mark.

### 3.5 DEMONSTRATION/TEST CYLINDER PILE

Construct 2 demonstration/test cylinder piles in the presence of the Contracting Officer to demonstrate the adequacy of methods and equipment. Drill this test hole in a position as directed by the Contracting Officer and drill to the maximum depth for any production shaft shown in the plans. Approved demonstration/test cylinder piles will become part of final work. Failure to demonstrate the adequacy of methods or equipment to the Contracting Officer is cause for the Contracting Officer to require appropriate alterations in equipment and/or method by the Contractor to eliminate unsatisfactory results. Provide any additional demonstration/test cylinder piles required to demonstrate the adequacy of methods or equipment at no expense to the Government. Make no changes in methods or equipment after initial approval without the consent of the Contracting Officer.

### 3.6 TESTING

The following integrity testing will be performed on the 2 demonstration/test cylinder piles and 1 to 3 additional piles selected by the Contracting Officer. In addition, if, in the opinion of the Contracting Officer, any completed cylinder pile is judged or suspected to be defective to such an extent that its design structural strength could not be guaranteed, then suitable integrity tests shall be conducted by the Contractor in the presence of the Contracting Officer: The tests shall be performed by an independent testing laboratory or other qualified testing firm experienced in the use of equipment and interpretation of results for

the type of equipment proposed. The method of testing shall be determined by the Contracting Officer. The tests shall be conducted to investigate the structural integrity of the cylinder pile including testing for soil contamination, necking, poor quality concrete, and voids. Techniques that may be used for testing of the completed shaft include:

1. External vibration of the cylinder pile and recording signals with transducers at the head of the pile.
2. External vibration of the cylinder pile and recording signals with transducers that are embedded in the concrete.
3. Installation of three (3) access tubes in each cylinder pile selected for testing by the Contracting Officer and use of crosshole sonic logging (CSL) instrumentation to investigate the concrete between the access tubes. Dimensions, materials, and installation of access tubes and CSL testing procedures shall be in accordance with ASTM D 6760.

Test results shall be submitted in written form to the Contracting Officer promptly upon completion of the tests. If any defect is found, cost of testing shall be borne by the Contractor. If no defects are found and the construction meets the Contract requirements, then the cost of the testing shall be paid for by the Government. Remedial measures to correct deficiencies, if ordered by the Contracting Officer, shall be performed by the Contractor at no additional cost to the Government.

### 3.7 INCLINOMETER CASING

Contractor shall install 3 to 5 inclinometer casing (one casing per cylinder pile) in cylinder piles selected by the Contracting Officer. The casings shall be installed full length of the cylinder pile with one pair of casing grooves set parallel to the adjacent slope. Inclinometer casings shall be of sufficient diameter to accommodate CSL instrumentation.

### 3.8 RECORDS

Keep complete and accurate records of all cylinder pile installations. Include locations, shaft diameters, top and bottom elevations, temporary casing dimensions and descriptions, slurry test results, (description of other means used to stabilize excavation), concrete strength, concrete volume, excavation condition, dates of excavation and concrete placement, and subsurface water conditions. Location shall be based on the survey of the registered surveys or engineer provided by the Contractor. All records, including corrective measures, shall be tabulated. Sample forms are attached to this Section.

-- End of Section --

# CAISSON LOGS

Contractor : \_\_\_\_\_  
Construction Supervisor : \_\_\_\_\_  
District : \_\_\_\_\_  
Subdivision : \_\_\_\_\_  
Project : \_\_\_\_\_  
Structure : \_\_\_\_\_  
Foundation Element : \_\_\_\_\_  
Drilled Shaft No. : \_\_\_\_\_

Contract No. : \_\_\_\_\_

General Contractor : \_\_\_\_\_

Project Superintendent : \_\_\_\_\_

Inspector : \_\_\_\_\_

Geotechnical Office : \_\_\_\_\_

Engineering Office : \_\_\_\_\_

Date(s) : \_\_\_\_\_

## DRILLING PROCEDURES AND RESULTS

FOUNDATION PLAN NO \_\_\_\_\_

THEORETICAL DIAMETER: \_\_\_\_\_

THEORETICAL INCLINATION: \_\_\_\_\_

Begun \_\_\_\_\_ at \_\_\_\_\_ a.m. Completed \_\_\_\_\_ at \_\_\_\_\_ a.m.  
p.m. p.m.

| Ground elevation at time of drilling |      |       | _____ ft         | Site Datum  | Type and main characteristics of drilling and lifting machines<br>Access conditions |   |
|--------------------------------------|------|-------|------------------|-------------|---|---|
| Drilling elevation                   |      |       | _____ ft SD      |             |   |   |
| Level of bottom of borehole          |      |       | _____ ft SD      | anticipated |   |   |
|                                      |      |       | _____ ft SD      | actual      |   |   |
| Total length of borehole             |      |       | _____ ft         |             |   |   |
| Upper level of casing or collar      |      |       | _____ ft SD      |             |   |   |
| Lower level of casing or collar      |      |       | _____ ft SD      |             |   |   |
| Length of casing or collar           |      |       | _____ ft         |             |   |   |
| Date                                 | Time | Depth | Soil Description | Tool        |   | OBSERVATIONS (setbacks, caveins, cavities, waterflow, slurry loss, recycling of slurry, etc.) |
|                                      |      |       |                  | Type        | Details   |   |
|                                      |      |       |                  |             |   |   |

# 

## 

### 

#### 

##### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

###### 

######

## CASING OR LINER

Refer to plan no. \_\_\_\_\_

|  |   |
|--|---|
| Upper level : _____ ft SD  | Nature of casing or liner : _____   |
| Lower level : _____ ft SD  | Type and method of possible coating : _____                                   |
| Total length : _____ ft  | Component { _____ x _____ ft      Joints: _____<br>lengths { _____ x _____ ft |
| Outside diameter: _____ ft   | Bracing system: _____   |
| Thickness : _____ in   | Observations - Stockpiling - Placement difficulties: _____                    |
| Placement { before <input type="checkbox"/><br>with <input type="checkbox"/> reinforcing | _____   |

## REINFORCING STEEL

|   |  |
|---|--|
| Upper level : _____ ft SD   | Method of fastening of hoops to longitudinal bars { by welding <input type="checkbox"/><br>by tying <input type="checkbox"/><br>combination <input type="checkbox"/>         |
| Lower level : _____ ft SD   | Method of fastening of cage components to each other { by welding <input type="checkbox"/><br>by connectors <input type="checkbox"/><br>combination <input type="checkbox"/> |
| Total length : _____ ft   | Component { _____ x _____ ft      Length of overlaps { _____<br>lengths { _____ x _____ ft   |
| Outside diameter: _____ ft  | Centering guides { Type : _____<br>Number: _____ every _____   |
| Base of cage : _____  | Storage conditions : _____   |
| Cage { suspended at top <input type="checkbox"/><br>placed on bottom <input type="checkbox"/> | Coating system : _____   |
| Observations - Placement difficulties: _____  |  |

## INSTALLATION OF ACCESS TUBES FOR INGTEGRITY TESTS

| Number | Diameter<br>in | Upper level<br>ft SD | Lower level<br>ft SD | Total length<br>ft | Type of plugs | Method of attachment<br>to reinforcing |
|--------|----------------|----------------------|----------------------|--------------------|---------------|--|
|        |                |                      |                      |                    |               |  |
|        |                |                      |                      |                    |               |  |

SAMPLE

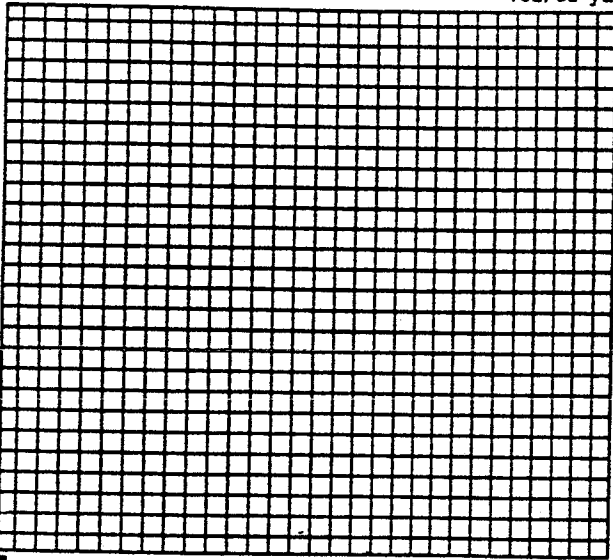
# CONCRETING

Begun \_\_\_\_\_ at \_\_\_\_\_ a.m. Completed \_\_\_\_\_ at \_\_\_\_\_ a.m.  
p.m. p.m.

| Source of design of mix   | Concrete components | Category | Class | Origin   | Proportion |
|---|---------------------|----------|-------|--|------------|
| Standard design <input type="checkbox"/>  | Cement              |          |       |  |            |
| Special design <input type="checkbox"/>   | Aggregates          |          |       |  |            |
| Job-site design <input type="checkbox"/>  |                     |          |       |  |            |
| Other <input type="checkbox"/>  |                     |          |       |  |            |
| - : _____   |                     |          |       |  |            |
| - : _____   |                     |          |       |  |            |
| - : _____   |                     |          |       |  |            |
| Supplying by concrete mixers  | Water               |          |       |  |            |
| 1st _____ cu yd   | Additives           |          |       |  |            |
| 2nd _____ cu yd   |                     |          |       |  |            |
| 3rd _____ cu yd   |                     |          |       |  |            |
| 4th _____ cu yd   |                     |          |       |  |            |
| 5th _____ cu yd   |                     |          |       |  |            |
| 6th _____ cu yd   |                     |          |       |  |            |
| 7th _____ cu yd   |                     |          |       |  |            |
| Placement techniques  |                     |          |       | Type of priming plug   |            |
| Tremie<br>without couplings <input type="checkbox"/> { O.D.: _____ in upper level (tremie base) I.D.: _____ in<br>base level : _____ ft SD<br>distance under tremie : _____ ft SD<br>with couplings <input type="checkbox"/> : _____ ft |                     |          |       | - concreting directly from mixer <input type="checkbox"/><br>- concreting using bucket _____ cu yd <input type="checkbox"/><br>- concreting by pump with piston <input type="checkbox"/><br>- Other <input type="checkbox"/> |            |
| Bucket Model _____ Capacity _____ cu yd   |                     |          |       | Output _____ cu yd/hr  |            |

SAMPLE

# CONCRETING (con'd)

| Placment control : _____  |  | Concrete quality tests   |                             |           |                 |         |
|---|--|--|-----------------------------|-----------|-----------------|---------|
|   |  | Concrete mixer or truck  | Addition of water gal/cu yd | Slump, in | Number of tests |         |
|   |  |  |                             |           | comp.           | bending |
| Maximum concreting level: _____ ft SD   |  |  |                             |           |                 |         |
| Height of fresh, purged concrete: _____ ft  |  |  |                             |           |                 |         |
| Upper shaft level before trimming: _____ ft SD  |  |  |                             |           |                 |         |
| Shaft length before trimming: _____ ft  |  |  |                             |           |                 |         |
| Corresponding theor. vol.: $V_t = \text{_____ cu yd/ft}$<br>$\times \text{_____ ft} = \text{_____ cu yd}$                   |  |  |                             |           |                 |         |
| Volume of excess in last truck: $V_e = \text{_____ cu yd}$  |  |  |                             |           |                 |         |
| Volume used in overflow and purging: $V_p = \text{_____ cu yd}$   |  |  |                             |           |                 |         |
| Actual, total consumption ( $V_p$ included): $V = V_t - V_e = \text{_____ cu yd}$   |  |  |                             |           |                 |         |
| Actual pile volume before trimming: $V_r = V - V_p = \text{_____ cu yd}$  |  |  |                             |           |                 |         |
| Overpour<br>$V_s = V_r - V_t = \text{_____ cu yd}$<br>$\frac{V_r - V_t}{V_t} \times 100 = \text{_____ \%}$                  |  |  |                             |           |                 |         |
| <p>CONCRETING CURVE</p>  <p>Depth ft</p> |  | <p>OBSERVATIONS: Operation of central mixing plant, supply irregularities (concrete delays), possible setbacks (loss of priming in the tremie, rising or lowering of reinforcing, difficulties with extraction of temporary casing, caving, etc.)</p> <p><b>SAMPLE</b></p> |                             |           |                 |         |
| Trimmed elevation _____ ft SD - Planned elevation _____ ft SD   |  |  |                             |           |                 |         |



# TESTS OF COMPLETED DRILLED SHAFT

|   |      |          |           |   |       |             |           |           |           |              |
|---|------|----------|-----------|---|-------|-------------|-----------|-----------|-----------|--------------|
| Method of acoustic investigation            | Date | Operator | Report No | Coring  | Date  | Operator    | Report No |           |           |              |
| Wave transmission using reflection method   |      |          |           |   |       |             |           |           |           |              |
| Lateral transmission of waves               |      |          |           |   |       |             |           |           |           |              |
| Radioactive transmission of waves           |      |          |           | Corer: _____<br>Coring tool { Brand : _____ Type : _____<br>O.D. : _____ I.D. : _____<br>Crown type : _____ |       |             |           |           |           |              |
| Other                                       |      |          |           | Depth   | Level | Description | # Core    | Force lbs | Speed rpm | Adv. rate in |
| Defects Observed<br>Position Assumed Nature |      |          |           |   |       |             |           |           |           |              |
|   |      |          |           |   |       |             |           |           |           |              |
| View with T.V. camera                       | Date | Operator | Report No |   |       |             |           |           |           |              |

SAMPLE

## WEATHER

Date: \_\_\_\_\_

| Hours | Temperature | Humidity | Precipitation |                      | Atmospheric conditions | Wind velocity | Sky Conditions | Sunshine | Observations |
|-------|-------------|----------|---------------|----------------------|------------------------|---------------|----------------|----------|--------------|
|       |             |          | Type          | Rate and/or duration |                        |               |                |          |              |
|       |             |          |               |                      |                        |               |                |          |              |

## INFORMATION ON COMPLETED DRILLED SHAFT

|   |                               |
|---|-------------------------------|
| <p>Diagram of location of completed drilled shaft in relation to theoretical location</p> <p>(report and mark position of access tubes)</p><br><br><br><br><br><br><br><br><br><br> | Finished length: _____ ft     |
|   |                               |
|   |                               |
|   | Height above ground: _____ ft |
|   | Inspector                     |
| <p>Note: For all operations, taking of photographs is recommended, especially when there are setbacks or difficulties.</p>  |                               |

SAMPLE

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02510

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 PIPING
  - 1.2.1 Service Lines
  - 1.2.2 Potable Water Lines
  - 1.2.3 Excavation, Trenching, and Backfilling
- 1.3 SUBMITTALS
- 1.4 HANDLING

PART 2 PRODUCTS

- 2.1 PIPE
  - 2.1.1 Copper Tubing
- 2.2 FITTINGS AND SPECIALS
  - 2.2.1 Copper Tubing System
- 2.3 JOINTS
  - 2.3.1 Copper Tubing Jointing
- 2.4 MISCELLANEOUS ITEMS
  - 2.4.1 Tapped Repair Clamps
  - 2.4.2 Corporation Stops
  - 2.4.3 Service Stops
  - 2.4.4 Service Boxes
  - 2.4.5 Disinfection

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Cutting of Pipe
  - 3.1.2 Adjacent Facilities
    - 3.1.2.1 Sewer Lines
    - 3.1.2.2 Water Lines
    - 3.1.2.3 Copper Tubing Lines
    - 3.1.2.4 Nonferrous Metallic Pipe
  - 3.1.3 Placing and Laying
    - 3.1.3.1 Piping Connections
  - 3.1.4 Jointing
    - 3.1.4.1 Copper Tubing Requirements
    - 3.1.4.2 Transition Fittings
  - 3.1.5 Installation of Service Lines
- 3.2 HYDROSTATIC TESTS
  - 3.2.1 Pressure Test
  - 3.2.2 Leakage Test
  - 3.2.3 Time for Making Test
  - 3.2.4 Concurrent Hydrostatic Tests
- 3.3 BACTERIAL DISINFECTION

Grand Forks Phase 2 Levees

3.3.1 Bacteriological Disinfection

3.4 CLEANUP

-- End of Section Table of Contents --

SECTION 02510

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 88M (1999) Seamless Copper Water Tube (Metric)

ASME INTERNATIONAL (ASME)

ASME B16.26 (1988) Cast Copper Alloy Pip Flanges, Class 150, 300, 400, 600, 900, 1500, and 2500, and Flanged Fittings, Class 150 and 300

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300 (1992) Hypochlorites

AWWA B301 (1992) Liquid Chlorine

AWWA C800 (1989) Underground Service Line Valves and Fittings

ASBESTOS CEMENT PIPE PRODUCERS ASSOCIATION (ACPPA)

ACPPA Work Practices (1988) Recommended Work Practices for A/C Pipe

NSF INTERNATIONAL (NSF)

NSF 61 (1999) Drinking Water System Components - Health Effects (Sections 1-9)

1.2 PIPING

This section covers water distribution and service lines, and connections to building service at a point approximately 5 feet outside buildings and structures to which service is required. The Contractor shall have a copy of the manufacturer's recommendations for each material or procedure to be utilized available at the construction site at all times.

1.2.1 Service Lines

Piping for water service lines less than 3 inches in diameter shall be copper tubing.

#### 1.2.2 Potable Water Lines

Piping and components of potable water systems which come in contact with the potable water shall conform to NSF 61.

#### 1.2.3 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling shall be in accordance with the applicable provisions of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, except as modified herein.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

##### Installation; FIO

The manufacturer's recommendations for each material or procedure to be utilized.

##### Satisfactory Installation; FIO

A statement signed by the principal officer of the contracting firm stating that the installation is satisfactory and in accordance with the contract drawings and specifications, and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

#### SD-09 Reports

##### Bacterial Disinfection; GA.

Test results from commercial laboratory verifying disinfection.

### 1.4 HANDLING

Pipe and accessories shall be handled to ensure delivery to the trench in sound, undamaged condition, including no injury to the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor in a satisfactory manner, at no additional cost to the Government. No other pipe or material shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

## PART 2 PRODUCTS

## 2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

### 2.1.1 Copper Tubing

Copper tubing shall conform to ASTM B 88M, Type K, annealed.

## 2.2 FITTINGS AND SPECIALS

### 2.2.1 Copper Tubing System

Fittings and specials shall be flared and conform to ASME B16.26.

## 2.3 JOINTS

### 2.3.1 Copper Tubing Jointing

Joints shall be compression-pattern flared and shall be made with the specified fittings.

## 2.4 MISCELLANEOUS ITEMS

### 2.4.1 Tapped Repair Clamps

Tapped repair clamps shall be built for type of pipe it is fitted to; band made of corrosion resistant Type 304 stainless steel. Outlet shall be sized for copper pipe and made of corrosion resistant Type 304 stainless steel. Nuts and bolts shall be stainless steel. Clamps shall utilize complete circle SBR gasket. Armor plate shall be permanently bonded to gasket.

### 2.4.2 Corporation Stops

Corporation stops shall have standard corporation stop thread conforming to AWWA C800 on the inlet end, with flanged joints, compression pattern flared tube couplings, or wiped joints.

### 2.4.3 Service Stops

Service stops shall be water-works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections or compression-pattern flared tube couplings, and shall be designed for a hydrostatic test pressure not less than 200 psi.

### 2.4.4 Service Boxes

Service boxes shall be cast iron or concrete and shall be extension service boxes of the length required for the depth of the line, with either screw or slide-type adjustment. The boxes shall have housings of sufficient size to completely cover the service stop or valve and shall be complete with identifying covers.

### 2.4.5 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Cutting of Pipe

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable. Copper tubing shall be cut square and all burrs shall be removed. Squeeze type mechanical cutters shall not be used for ductile iron.

##### 3.1.2 Adjacent Facilities

###### 3.1.2.1 Sewer Lines

Where the location of the water pipe is not clearly defined in dimensions on the drawings, the water pipe shall not be laid closer horizontally than 10 feet from a sewer except where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, in which case the water pipe shall not be laid closer horizontally than 6 feet from the sewer. Where water lines cross under gravity-flow sewer lines, the sewer pipe, for a distance of at least 10 feet each side of the crossing, shall be fully encased in concrete or shall be made of pressure pipe with no joint located within 3 feet horizontally of the crossing. Water lines shall in all cases cross above sewage force mains or inverted siphons and shall be not less than 2 feet above the sewer main. Joints in the sewer main, closer horizontally than 3 feet to the crossing, shall be encased in concrete.

###### 3.1.2.2 Water Lines

Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.

###### 3.1.2.3 Copper Tubing Lines

Copper tubing shall not be installed in the same trench with ferrous piping materials.

###### 3.1.2.4 Nonferrous Metallic Pipe

Where nonferrous metallic pipe, e.g. copper tubing, crosses any ferrous piping material, a minimum vertical separation of 12 inches shall be maintained between pipes.

##### 3.1.3 Placing and Laying

Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Water-line materials shall not be dropped or dumped into the trench. Abrasion of the pipe coating shall be avoided. Except where necessary in making



connections with other lines or as authorized by the Contracting Officer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joints are complete. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by and at the Contractor's expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as shown.

#### 3.1.3.1 Piping Connections

Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. When made under pressure, these connections shall be installed using standard methods as approved by the Contracting Officer. Connections to existing asbestos-cement pipe shall be made in accordance with ACPPA Work Practices.

#### 3.1.4 Jointing

##### 3.1.4.1 Copper Tubing Requirements

Joints shall be made with flared fittings. The flared end tube shall be pulled tightly against the tapered part of the fitting by a nut which is part of the fitting, so there is metal-to-metal contact.

##### 3.1.4.2 Transition Fittings

Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

#### 3.1.5 Installation of Service Lines

Service lines shall include the pipeline connecting building piping to water distribution lines to the connections with the building service at a point approximately 5 feet outside the building where such building service exists. Where building services are not installed, the Contractor shall terminate the service lines approximately 5 feet from the site of the proposed building at a point designated by the Contracting Officer. Such service lines shall be closed with plugs or caps. All service stops and valves shall be provided with service boxes.

### 3.2 HYDROSTATIC TESTS

Where any section of a water line is provided with concrete thrust blocking for fittings, the hydrostatic tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

#### 3.2.1 Pressure Test

After the pipe is laid, the joints completed and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified,

be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

- a. Wet or unstable soil conditions in the trench.
- b. Compliance would require maintaining barricades and walkways around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions.
- c. Maintaining the trench in an open condition would delay completion of the project.

The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

### 3.2.2 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to not less than 200 psi pressure. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section, necessary to maintain pressure within 5 psi of the specified leakage test pressure after the pipe has been filled with water and the air expelled. Piping installation will not be accepted if leakage exceeds the allowable leakage which is determined by the following formula:

$$L = 0.0001351ND(P \text{ raised to } 0.5 \text{ power})$$

L = Allowable leakage in gallons per hour

N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

### 3.2.3 Time for Making Test

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Cement-mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure

test and subsequent leakage test.

#### 3.2.4 Concurrent Hydrostatic Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be as specified. Replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

- a. Pressure test and leakage test may be conducted concurrently.
- b. Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be reaccomplished.

### 3.3 BACTERIAL DISINFECTION

#### 3.3.1 Bacteriological Disinfection

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as specified. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be either liquid chlorine, calcium hypochlorite, or sodium hypochlorite, conforming to paragraph MISCELLANEOUS ITEMS. The chlorinating material shall provide a dosage of not less than 50 ppm and shall be introduced into the water lines in an approved manner. Polyvinyl Chloride (PVC) pipe lines shall be chlorinated using only the above specified chlorinating material in solution. The agent shall not be introduced into the line in a dry solid state. The treated water shall be retained in the pipe long enough to destroy all non-spore forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 25 ppm of free chlorine residual throughout the line at the end of the retention period. Valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. From several points in the unit, personnel from the Contractor's commercial laboratory shall take at least 3 water samples from different points, approved by the Contracting Officer, in proper sterilized containers and perform a bacterial examination in accordance with state approved methods. The commercial laboratory shall be certified by the state's approving authority for examination of potable water. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

### 3.4 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02531

SANITARY SEWERS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL REQUIREMENTS

PART 2 PRODUCTS

- 2.1 PIPE
  - 2.1.1 Plastic Pipe
    - 2.1.1.1 PVC Pipe
- 2.2 REQUIREMENTS FOR FITTINGS
  - 2.2.1 Fittings for Plastic Pipe
    - 2.2.1.1 Fittings for PVC Pipe
- 2.3 JOINTS
  - 2.3.1 Plastic Pipe Jointing

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Adjacent Facilities
    - 3.1.1.1 Water Lines
  - 3.1.2 Pipe Laying
    - 3.1.2.1 Trenches
    - 3.1.2.2 Backfill
    - 3.1.2.3 Width of Trench
    - 3.1.2.4 Jointing
    - 3.1.2.5 Handling and Storage
  - 3.1.3 Test for Deflection
- 3.2 CONCRETE CRADLE AND ENCASEMENT
- 3.3 INSTALLATION OF WYE BRANCHES
- 3.4 BUILDING CONNECTIONS

-- End of Section Table of Contents --

SECTION 02531

SANITARY SEWERS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |  |
|-------------|--|
| ASTM D 1784 | (1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds |
| ASTM D 3034 | (1998) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings                                       |
| ASTM D 3212 | (1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals                        |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

|            |  |
|------------|--|
| NFPA 49    | (1994) Hazardous Chemicals Data  |
| NFPA 325-1 | (1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids |
| NFPA 704   | (1996) Identification of the Fire Hazards of Materials for Emergency Respons   |

1.2 GENERAL REQUIREMENTS

The construction required herein shall include appurtenant structures and building sewers to points of connection with the building drains 5 feet outside the building to which the sewer system is to be connected. The Contractor shall replace damaged material and redo unacceptable work at no additional cost to the Government. Excavation and backfilling is specified in Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Backfilling shall be accomplished after inspection by the Contracting Officer. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

## PART 2 PRODUCTS

### 2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

#### 2.1.1 Plastic Pipe

##### 2.1.1.1 PVC Pipe

ASTM D 3034, Type PSM with a maximum SDR of 35, Size 6 inches or less in diameter. PVC shall be certified by the compounder as meeting the requirements of ASTM D 1784, cell Class 12454B. The pipe stiffness shall be greater than or equal to 735/D for cohesionless material pipe trench backfills.

### 2.2 REQUIREMENTS FOR FITTINGS

Fittings shall be compatible with the pipe supplied and shall have a strength not less than that of the pipe. Fittings shall conform to the respective specifications and other requirements specified below. Wye saddles, strap-on wyes, and T-fittings are prohibited.

#### 2.2.1 Fittings for Plastic Pipe

##### 2.2.1.1 Fittings for PVC Pipe

ASTM D 3034 for type PSM pipe.

### 2.3 JOINTS

Joints installation shall comply with the manufacturer's instructions.

#### 2.3.1 Plastic Pipe Jointing

Flexible plastic pipe (PVC or high density polyethylene pipe) gasketed joints shall conform to ASTM D 3212.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Adjacent Facilities

##### 3.1.1.1 Water Lines

Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be closer horizontally than 10 feet to a water-supply main or service line, except that where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, the horizontal spacing may be a minimum of 6 feet. Where gravity-flow sewers cross above water lines, the sewer pipe for a distance of 10 feet on each side of the crossing shall be fully encased in concrete or shall be acceptable pressure pipe with no joint closer horizontally than 3 feet to the crossing. The thickness of the concrete encasement including that at the pipe joints shall be not less than 4 inches.

### 3.1.2 Pipe Laying

- a. Pipe shall be protected during handling against impact shocks and free fall; the pipe interior shall be free of extraneous material.
- b. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawings. Pipe shall be laid and centered so that the sewer has a uniform invert. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials.
- c. Before making pipe joints, all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. The joints shall then be placed, fitted, joined, and adjusted to obtain the degree of water tightness required.

#### 3.1.2.1 Trenches

Trenches shall be kept free of water and as dry as possible during bedding, laying, and jointing and for as long a period as required. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings.

#### 3.1.2.2 Backfill

As soon as possible after the joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade. Plastic pipe shall be completely covered to prevent damage from ultraviolet light.

#### 3.1.2.3 Width of Trench

If the maximum width of the trench at the top of the pipe, as specified in Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, is exceeded for any reason other than by direction, the Contractor shall install, at no additional cost to the Government, concrete cradling, pipe encasement, or other bedding required to support the added load of the backfill.

#### 3.1.2.4 Jointing

Joints between different pipe materials shall be made as specified, using approved jointing materials.

#### 3.1.2.5 Handling and Storage

Pipe, fittings and joint material shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities for plastic pipe, fittings, joint materials and solvents shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325-1.

### 3.1.3 Test for Deflection

When flexible pipe is used, a deflection test shall be made on the entire

length of the installed pipeline not less than 30 days after the completion of all work including backfill and placement of any fill, grading, paving, concrete, or superimposed loads. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95 percent of the inside diameter of the pipe. A tolerance of plus 0.5 percent will be permitted. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of 70,000 psi or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on the opposite end of the shaft shall produce compression throughout the remote end of the ball, cylinder or circular section. Circular sections shall be spaced so that the distance from the external faces of the front and back sections shall equal or exceed the diameter of the circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through or by being flushed through with water, shall be cause for rejection of that run. When a deflection device is used for the test in lieu of the ball, cylinder, or circular sections described, such device shall be approved prior to use. The device shall be sensitive to 1.0 percent of the diameter of the pipe being measured and shall be accurate to 1.0 percent of the indicated dimension. Installed pipe showing deflections greater than 5.0 percent of the normal diameter of the pipe shall be retested by a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

### 3.2 CONCRETE CRADLE AND ENCASEMENT

The pipe shall be supported on a concrete cradle, or encased in concrete where indicated or directed.

### 3.3 INSTALLATION OF WYE BRANCHES

Wye branches shall be installed where sewer connections are indicated or where directed. Cutting into piping for connections shall not be done except in special approved cases. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, the pipe shall be encased in concrete backfill or supported on a concrete cradle as directed. Concrete required because of conditions resulting from faulty construction methods or negligence by the Contractor shall be installed at no additional cost to the Government. The installation of wye branches in an existing sewer shall be made by a method which does not damage the integrity of the existing sewer. One acceptable method consists of removing one pipe section, breaking off the upper half of the bell of the next lower section and half of the running bell of wye section. After placing the new section, it shall be rotated so that the broken half of the bell will be at the bottom. The two joints shall then be made with joint packing and cement mortar.

### 3.4 BUILDING CONNECTIONS

Building connections shall include the lines to and connection with the building waste drainage piping at a point approximately 5 feet outside the building, unless otherwise indicated. Where building drain piping is not installed, the Contractor shall terminate the building connections



Grand Forks Phase 2 Levees

approximately 5 feet from the site of the building at a point and in a manner designated.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02620

SUBDRAINAGE SYSTEM

PART 1 GENERAL

1.1 REFERENCES

1.2 SUBMITTALS

PART 2 PRODUCTS

2.1 MATERIALS

PART 3 EXECUTION

3.1 GENERAL

-- End of Section Table of Contents --

SECTION 02620

SUBDRAINAGE SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

|                      |  |
|----------------------|--|
| NDDOT SS             | (1997) Standard Specifications for Road and Bridge Construction  |
| NDDOT SS Section 714 | (1997) Standard Specifications for Road and Bridge Construction - Culverts, Storm Drains, Edge Drains, and Underdrains |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-13 Certificates

Materials; FIO

Certificate stating that the proposed pipe meets the requirements of the NDDOT SS.

PART 2 PRODUCTS

2.1 MATERIALS

All materials shall meet the requirements of NDDOT SS Section 714 and all other referenced sections and manuals indicated in NDDOT SS Section 714.

PART 3 EXECUTION

3.1 GENERAL

All construction shall meet the requirements of the NDDOT SS.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02630

STORM-DRAINAGE SYSTEM

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, STORAGE, AND HANDLING
  - 1.3.1 Delivery and Storage
  - 1.3.2 Handling

PART 2 PRODUCTS

- 2.1 PIPE FOR CULVERTS AND STORM DRAINS
  - 2.1.1 Concrete Pipe
  - 2.1.2 Corrugated Steel Pipe
- 2.2 DRAINAGE STRUCTURES
  - 2.2.1 Flared End Sections
- 2.3 MISCELLANEOUS MATERIALS
  - 2.3.1 Concrete
  - 2.3.2 Mortar
  - 2.3.3 Precast Reinforced Concrete Manholes
  - 2.3.4 Frame and Cover Castings
  - 2.3.5 Chimney Seal
  - 2.3.6 Steel Gratings
  - 2.3.7 Joints
    - 2.3.7.1 Flexible Watertight Joints
- 2.4 CHIMNEY SEALS
- 2.5 STEEL LADDER
  - 2.5.1 Cast-In-Place Concrete Structures
  - 2.5.2 Precast Concrete Manholes
- 2.6 DOWNSPOUT BOOTS

PART 3 EXECUTION

- 3.1 EXCAVATION FOR PIPE CULVERTS AND DRAINAGE STRUCTURES
  - 3.1.1 Trenching
  - 3.1.2 Removal of Unstable Material
- 3.2 BEDDING
  - 3.2.1 Concrete Pipe Requirements
  - 3.2.2 Corrugated Metal Pipe
- 3.3 PLACING PIPE
  - 3.3.1 Concrete Pipe
  - 3.3.2 Multiple Culverts
  - 3.3.3 Corrugated Metal Pipe
  - 3.3.4 Trenchless Technology (Pipe Jacking)
- 3.4 JOINTING
  - 3.4.1 Concrete Pipe
    - 3.4.1.1 Flexible Watertight Joints

Grand Forks Phase 2 Levees

- 3.4.2 Corrugated Metal Pipe
  - 3.4.2.1 Field Joints
  - 3.4.2.2 Flexible Watertight, Gasketed Joints
- 3.5 DRAINAGE STRUCTURES
  - 3.5.1 Manholes
- 3.6 STEEL LADDER INSTALLATION
- 3.7 BACKFILLING
  - 3.7.1 Backfilling Pipe in Trenches
  - 3.7.2 Backfilling Pipe in Fill Sections
  - 3.7.3 Movement of Construction Machinery
  - 3.7.4 Compaction
    - 3.7.4.1 Minimum Density
  - 3.7.5 Determination of Density

-- End of Section Table of Contents --

SECTION 02630

STORM-DRAINAGE SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |  |
|-------------------|--|
| ASTM A 48         | (2000) Gray Iron Castings  |
| ASTM A 123/A 123M | (2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products   |
| ASTM A 240/A 240M | (1996) Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels    |
| ASTM A 536        | (1999e1) Ductile Iron Castings   |
| ASTM A 760/A 760M | (2000) Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains  |
| ASTM A 798/A 798M | (1997a) Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications                            |
| ASTM C 76         | (1999) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe  |
| ASTM C 231        | (1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method  |
| ASTM C 270        | (1997ae1) Mortar for Unit Masonry  |
| ASTM C 443        | (1998) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets                                   |
| ASTM C 478        | (1997) Precast Reinforced Concrete Manhole Sections  |
| ASTM C 923        | (1998) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Materials                    |
| ASTM D 1557       | (1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu ft (2,700 kN-m/cu m)) |

|             |   |
|-------------|---|
| ASTM D 1751 | (1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) |
| ASTM D 1752 | (1984; R 1996el) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction             |
| ASTM D 2167 | (1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method  |
| ASTM D 2922 | (1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)   |
| ASTM D 3017 | (1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)   |
| ASTM F 593  | (1998) Stainless Steel Bolts, Hex Cap Screws, and Studs   |
| ASTM F 594  | (1998) Stainless Steel Nuts   |

AMERICAN RAILWAY ENGINEERING & MAINTENANCE-OF-WAY ASSOCIATION  
(AREMA)

|              |  |
|--------------|--|
| AREMA Manual | (1999) Manual for Railway Engineering (4 Vol.) |
|--------------|--|

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

Placing Pipe; FIO

Printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

### SD-13 Certificates

Pipe Certification; GA  
Hydrostatic Test on Watertight Joints; GA  
Determination of Density; GA  
Frame and Cover Castings; GA

Certified copies of test reports demonstrating conformance to applicable pipe specifications, before pipe is installed.  
Certification on the ability of frame and cover or gratings to carry the imposed live load.

## 1.3 DELIVERY, STORAGE, AND HANDLING

#### 1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer.

#### 1.3.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

### PART 2 PRODUCTS

#### 2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

##### 2.1.1 Concrete Pipe

ASTM C 76 with pipe class as indicated on drawings. Concrete pipe outlets through the levees, from the pump stations and discharge chambers, shall be constructed of pipe sections a maximum of 4 feet in length.

##### 2.1.2 Corrugated Steel Pipe

ASTM A 760/A 760M, zinc or aluminum (Type 2) coated pipe of either:

- a. Type I pipe with annular or helical 2-2/3 by 1/2 inch corrugations.
- b. Type IR pipe with helical 3/4 by 3/4 by 7-1/2 inch corrugations.

#### 2.2 DRAINAGE STRUCTURES

##### 2.2.1 Flared End Sections

Sections shall be of a standard design meeting requirements of ASTM C 76.

#### 2.3 MISCELLANEOUS MATERIALS

##### 2.3.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements under Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall be as shown on the drawings. Expansion-joint filler material shall conform to ASTM D 1751, or ASTM D 1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D 1752.



### 2.3.2 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C 270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalies, and organic impurities.

The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

### 2.3.3 Precast Reinforced Concrete Manholes

Precast reinforced concrete manholes shall conform to ASTM C 478. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure. Joints shall meet the requirements of paragraph JOINTS.

### 2.3.4 Frame and Cover Castings

Frame and cover for gratings shall be cast gray iron, ASTM A 48, Class 35B or cast ductile iron, ASTM A 536, Grade 65-45-12. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans.

### 2.3.5 Chimney Seal

Contractor may provide a standard type manhole casting with chimney seal in place of providing a floating type manhole casting. Provide chimney seals on all inlet castings. Provide chimney seals on all inlet castings. Provide extensions as required.

If this option is chosen, new or existing manhole cones used for this installation must have a vertical top segment of 2 inches minimum length as shown on Chimney Seal & Casting Detail Option. For installation on existing manhole cone with 2 inch vertical top segment, this option may also be used if an adjusting ring is fastened to top of existing manhole as shown on drawings and as specified. Standard type manhole castings used in place of a floating type manhole casting shall have flanges drilled to receive rebar as shown on drawings.

Chimney seals shall be manufactured by Cretex Specialty Products, or approved equal. The sleeve and extension shall be extruded from a high-grade rubber compound conforming to the applicable requirements of ASTM C 923. The bands used for compressing the sleeve and extension against the manhole shall be fabricated from 16 gauge stainless steel conforming to ASTM A 240/A 240M Type 304. Screws, bolts and nuts used on this band shall be stainless steel conforming to ASTM F 593 and ASTM F 594, Type 304.

### 2.3.6 Steel Gratings

Steel gratings shall be in accordance with Section 05500 MISCELLANEOUS METALS.

### 2.3.7 Joints

#### 2.3.7.1 Flexible Watertight Joints

- a. Materials: Flexible watertight joints shall be made with rubber-type gaskets for concrete pipe. The design of joints and the physical requirements for rubber-type gaskets shall conform to ASTM C 443. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.
- b. Test Requirements: Watertight joints shall be visually inspected after installation. Any unsatisfactory joint shall be removed and replaced at the Contractor's expense and at no additional cost to the Government.

## 2.4 CHIMNEY SEALS

Chimney seals shall be provided with manhole castings and inlet castings. Extensions shall also be provided as required. When chimney seals are used, manhole cones shall have a minimum vertical top segment of 2 inches. The sleeve and extension shall be extruded from a high-grade rubber compound conforming to the applicable requirements of ASTM C 923. The bands used for compressing the sleeve and extension shall be fabricated from 16 gauge stainless steel conforming to ASTM A 240/A 240M Type 304. Screws, bolts and nuts shall be stainless steel conforming to ASTM F 593 and ASTM F 594, Type 304. Chimney seals shall be manufactured by Cretex Specialty Products, or approved equal.

## 2.5 STEEL LADDER

### 2.5.1 Cast-In-Place Concrete Structures

Steel ladder shall be provided for cast-in-place concrete structures, including pump stations, discharge chambers, drop inlet structures, and junction manholes, as shown. These ladders shall be not less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2-1/2 inches wide. Ladders shall be in accordance with Section 05500 MISCELLANEOUS METAL. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123/A 123M.

### 2.5.2 Precast Concrete Manholes

Steel ladders shall be provided for precast manholes 12 feet in depth or greater. Ladders shall be as shown. Ladders shall be in accordance with Section 05500 MISCELLANEOUS METAL. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123/A 123M.

Manhole steps shall be provided for manholes less than 12 feet in depth. Manhole steps shall be a minimum of 12 inches wide with rungs spaced maximum 16 inches apart. Manhole steps shall be polypropylene-coated steel and shall be in accordance with Section 05500 MISCELLANEOUS METAL.

## 2.6 DOWNSPOUT BOOTS

Boots used to connect exterior downspouts to the storm-drainage system shall be of gray cast iron conforming to ASTM A 48, Class 30B or 35B. Shape and size shall be as indicated.

## PART 3 EXECUTION

### 3.1 EXCAVATION FOR PIPE CULVERTS AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains shall be in accordance with the applicable portions of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, Section 02300 EARTHWORK, and the requirements specified below. Excavation and backfill for junction manholes, discharge chambers, and pump stations shall be in accordance with Section 02315 EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES.

Per Contract Alternate No. 1, trenchless technology may be required for storm sewer pipe crossing under Lewis Boulevard in Reach 1. Obtain Government approval for proposed crossing technique a minimum of 30 days prior to planned construction in this area. Methods of operation and installation shall conform to requirements specified in Volume 1, Chapter 1, Part 4 of AREMA Manual.

#### 3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be as specified on drawings. Sheet piling and bracing, where required, shall be placed within the trench width as specified. Contractor shall not overexcavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

#### 3.1.2 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheet piling, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Government.

### 3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

#### 3.2.1 Concrete Pipe Requirements

Bedding Class B shall be used. Concrete pipe shall be bedded in aggregate bedding material accurately shaped and rounded to conform to the lowest one-half of the outside portion of circular pipe for the entire length of the pipe. The bedding shall be tamped. Bell holes and depressions for joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

#### 3.2.2 Corrugated Metal Pipe

Bedding for corrugated metal pipe and pipe arch shall be in accordance with ASTM A 798/A 798M. It is not required to shape the bedding to the pipe

geometry.

### 3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

#### 3.3.1 Concrete Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

#### 3.3.2 Multiple Culverts

Where multiple lines of pipe are installed, adjacent sides of pipe shall be at least half the nominal pipe diameter or 3 feet apart, whichever is less, unless specified otherwise.

#### 3.3.3 Corrugated Metal Pipe

Laying shall be with the separate sections joined firmly together, with the outside laps of circumferential joints pointing upstream, and with longitudinal laps on the sides.

#### 3.3.4 Trenchless Technology (Pipe Jacking)

Methods of operation and installation of pipe using trenchless technology (pipe jacking) shall conform to requirements specified in Volume 1, Chapter 1, Part 4 of AREMA Manual.

### 3.4 JOINTING

#### 3.4.1 Concrete Pipe

##### 3.4.1.1 Flexible Watertight Joints

Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

#### 3.4.2 Corrugated Metal Pipe

##### 3.4.2.1 Field Joints

Transverse field joints shall be designed so that the successive connection

of pipe sections will form a continuous line free of appreciable irregularities in the flow line. In addition, the joints shall meet the general performance requirements described in ASTM A 798/A 798M. Suitable transverse field joints which satisfy the requirements for one or more of the joint performance categories can be obtained with the following types of connecting bands furnished with suitable band-end fastening devices: corrugated bands, bands with projections, flat bands, and bands of special design that engage factory reformed ends of corrugated pipe. The space between the pipe and connecting bands shall be kept free from dirt and grit so that corrugations fit snugly. The connecting band, while being tightened, shall be tapped with a soft-head mallet of wood, rubber or plastic, to take up slack and ensure a tight joint. Field joints for each type of corrugated metal pipe shall maintain pipe alignment during construction and prevent infiltration of fill material during the life of the installations. The type, size, and sheet thickness of the band and the size of angles or lugs and bolts shall be as indicated or where not indicated, shall be as specified in the applicable standards or specifications for the pipe.

#### 3.4.2.2 Flexible Watertight, Gasketed Joints

Installation shall be as recommended by the gasket manufacturer for use of lubricants and cements and other special installation requirements. The gasket shall be placed over one end of a section of pipe for half the width of the gasket. The other half shall be doubled over the end of the same pipe. When the adjoining section of pipe is in place, the doubled-over half of the gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so that the gasket covers the end of pipe sections equally. Connecting bands shall be centered over adjoining sections of pipe, and rods or bolts placed in position and nuts tightened. Band Tightening: The band shall be tightened evenly, even tension being kept on the rods or bolts, and the gasket; the gasket shall seat properly in the corrugations. Watertight joints shall remain uncovered for a period of time designated, and before being covered, tightness of the nuts shall be measured with a torque wrench. If the nut has tended to loosen its grip on the bolts or rods, the nut shall be retightened with a torque wrench and remain uncovered until a tight, permanent joint is assured.

### 3.5 DRAINAGE STRUCTURES

#### 3.5.1 Manholes

Construction shall be of precast reinforced concrete, complete with frames and cover castings or gratings, and equipped with manhole steps or fixed galvanized steel ladders, as indicated on drawings. Pipe connections to concrete manholes and inlets shall be made with flexible watertight joints.

### 3.6 STEEL LADDER INSTALLATION

Ladder shall be adequately anchored to the wall by means of steel inserts spaced not more than 6 feet vertically, and shall be installed to provide at least 6 inches of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

### 3.7 BACKFILLING

#### 3.7.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 12 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Testing shall be in accordance with Section 02316 EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITY SYSTEMS. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

### 3.7.2 Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in loose layers not exceeding 12 inches.

### 3.7.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be replace and joints repaired.

### 3.7.4 Compaction

#### 3.7.4.1 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

- a. Under paved roads, including adjacent shoulder areas, the density shall be not less than 95 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control. See Section 02300 EARTHWORK.
- b. Under unpaved roads, density shall not be less than 95 percent of maximum density for cohesive material and 95 percent of maximum

density for cohesionless material.

- c. Under nontraffic areas and levees, density shall be not less than that of the surrounding material.

### 3.7.5 Determination of Density

Testing shall be the responsibility of the Contractor and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D 1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017 or ASTM D 2922. Test results shall be furnished the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02721

RIGID BASE COURSE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 SAMPLING AND TESTING

PART 2 PRODUCTS

- 2.1 MATERIALS

PART 3 EXECUTION

- 3.1 GENERAL

-- End of Section Table of Contents --



SECTION 02721

RIGID BASE COURSE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

|                      |  |
|----------------------|--|
| NDDOT SS             | (1997) Standard Specifications for Road and Bridge Construction                                    |
| NDDOT SS Section 302 | (1997) Standard Specifications for Road and Bridge Construction - Aggregate Base or Surface Course |
| NDDOT FSTM           | Field Sampling and Testing Manua   |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Waybills and Delivery Tickets; FIO

Copies of waybills and delivery tickets during the progress of the work. Certified waybills and delivery tickets for all aggregates actually used.

SD-09 Reports

Sampling and Testing; FIO

Copies of initial and in-place test results.

1.3 SAMPLING AND TESTING

Sampling and testing shall be performed in accordance with NDDOT FSTM.

The following revision is made to NDDOT FSTM, NDDOT SS Section 302: Perform gradation on every 1,000 ton of material placed, or fraction thereof, determine physical properties once.

PART 2 PRODUCTS

2.1 MATERIALS

All products shall meet the requirements of NDDOT SS Section 302 and all other reference sections and manuals indicated in NDDOT SS Section 302. Aggregate gradations for aggregate base course and surface course specified in the NDDOT SS shall be strictly adhered to.

PART 3 EXECUTION

3.1 GENERAL

Furnishing, placing, compaction, preparation, and testing shall meet the requirements of the NDDOT SS.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02741

ASPHALTIC CONCRETE PAVEMENT

PART 1 GENERAL

- 1.1 DESCRIPTION
- 1.2 CONSTRUCTION REQUIREMENTS

PART 2 PRODUCTS

- 2.1 ASPHALTIC CONCRETE PAVEMENT

PART 3 EXECUTION

- 3.1 ASPHALTIC CONCRETE PAVEMENT

-- End of Section Table of Contents --

SECTION 02741

ASPHALTIC CONCRETE PAVEMENT

PART 1 GENERAL

1.1 DESCRIPTION

This work shall consist of the construction of an asphaltic concrete pavement including a plant mixed base and surface course of the thickness and dimensions shown on the plans, typical sections, special provisions and described in the proposal. A single surface treatment aggregate seal coat shall be required and included as part of the pavement unless otherwise specified in the bidding documents.

1.2 CONSTRUCTION REQUIREMENTS

All construction shall meet the requirements of the City of Grand Forks standard construction specifications.

PART 2 PRODUCTS

2.1 ASPHALTIC CONCRETE PAVEMENT

All materials and construction shall meet the requirements of the City of Grand Forks standard construction specifications.

PART 3 EXECUTION

3.1 ASPHALTIC CONCRETE PAVEMENT

All construction shall meet the requirements of the City of Grand Forks standard construction specifications.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02754

CONCRETE PAVEMENTS FOR SMALL PROJECTS

PART 1 GENERAL

1.1 REFERENCES

1.2 SUBMITTALS

PART 2 PRODUCTS

2.1 MATERIALS

PART 3 EXECUTION

3.1 GENERAL

3.2 SAMPLING AND TESTING

-- End of Section Table of Contents --

SECTION 02754  
CONCRETE PAVEMENTS FOR SMALL PROJECTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

|                      |   |
|----------------------|---|
| NDDOT SS             | (1997) Standard Specifications for Road and Bridge Construction                                     |
| NDDOT SS Section 550 | (1997) Standard Specifications for Road and Bridge Construction - Portland Cement Concrete Pavement |
| NDDOT FSTM           | Field Sampling and Testing Manua  |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Paving; GA

Paving Schedules at least 7 days prior to start of paving.

Mixture Proportions; GA

The report of the Contractor's mixture proportioning studies showing the proportions of all ingredients and supporting information on aggregate and other materials that will be used in the manufacture of concrete, at least 14 days prior to commencing concrete placing operations.

SD-09 Reports

Testing; FIO

Copies of testing results as required.

PART 2 PRODUCTS

2.1 MATERIALS

All products shall meet the requirements of NDDOT SS Section 550 and all ohter referenced sections and manuals indicated in NDDOT SS Section 550.

PART 3 EXECUTION

3.1 GENERAL

All work of constructing concrete pavement shall be the requirements of the NDDOT SS.

3.2 SAMPLING AND TESTING

Sampling and testing shall be performed in accordance with NDDOT FSTM.

The following revisions are made to NDDOT FSTM, NDDOT SS Section 550:

- a. Cast 2 flexure test beams.
- b. No depth check as described will be required.
- c. Provide a certification for cement only.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02760

FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS

PART 1 GENERAL

1.1 REFERENCES

1.2 SUBMITTALS

PART 2 PRODUCTS

2.1 MATERIALS

PART 3 EXECUTION

3.1 GENERAL

-- End of Section Table of Contents --



SECTION 02760

FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

|          |   |
|----------|---|
| NDDOT SS | (1997) Standard Specifications for Road and Bridge Construction |
|----------|---|

|                      |  |
|----------------------|--|
| NDDOT SS Section 826 | (1997) Standard Specifications for Road and Bridge Construction - Joint Material |
|----------------------|--|

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-13 Certificates

Product Information; FIO

The Contractor shall submit product information and certification that verifies products meet the requirements specified in the NDDOT SS Section 826.

PART 2 PRODUCTS

2.1 MATERIALS

Joint material in concrete pavement shall be silicone sealant. Material shall meet the requirements of the specified sections of the NDDOT SS.

PART 3 EXECUTION

3.1 GENERAL

Installation of joint material shall meet the requirements of the specified sections of the NDDOT SS.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02763

PAVEMENT MARKINGS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS

PART 2 PRODUCTS

- 2.1 STANDARD PAVEMENT MARKING MATERIALS
  - 2.1.1 Epoxy Pavement Markings
    - 2.1.1.1 Epoxy Resin Materials
    - 2.1.1.2 Glass Beads

PART 3 EXECUTION

- 3.1 STANDARD PAVEMENT MARKING EXECUTION
- 3.2 EPOXY PAVEMENT MARKING EQUIPMENT
- 3.3 EPOXY PAVEMENT MARKING PROCEDURES
- 3.4 EPOXY PAVEMENT MARKING SPRAYING OPERATION

-- End of Section Table of Contents --

SECTION 02763

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 247 (1981; R 1996) Glass Beads Used in Traffic Paint

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 501 (1984; R 1996) Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser

ASTM D 638 (2001) Tensile Properties of Plastics

ASTM D 695 (1996) Compressive Properties of Rigid Plastics

ASTM D 2240 (1997e1) Rubber Property - Durometer Hardness

FEDERAL SPECIFICATIONS (FS)

FS 595 (1989) Colors

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

NDDOT SS (1997) Standard Specifications for Road and Bridge Construction

NDDOT SS Section 762 (1997) Standard Specifications for Road and Bridge Construction - Pavement Markings

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-13 Certificates

Standard Pavement Marking Materials; FIO

Certificate stating that the proposed pavement marking paint meets the requirements of the NDDOT SS.

## PART 2 PRODUCTS

### 2.1 STANDARD PAVEMENT MARKING MATERIALS

All materials shall meet the requirements of NDDOT SS Section 762 and all other referenced sections and manuals indicated in NDDOT SS Section 762.

#### 2.1.1 Epoxy Pavement Markings

The material shall consist of reflectorized white and yellow two-component, 100 percent solids epoxy pavement markings. This specification provides for the classification of epoxy resin pavement marking systems by type.

Type I - A fast cure material suitable for line applications and, under ideal conditions, may not require coning.

Type II - A slow cure material suitable for all applications of pavement markings under controlled traffic conditions, i.e., coning and flagging are required.

##### 2.1.1.1 Epoxy Resin Materials

The material shall be composed of epoxy resins and pigments only. No solvents are to be given off to the environment upon application to a pavement surface. Type II material shall be completely free of TMFPTA (Tri-Methyl Propane Tri-Acrylate) and other multi-functional monomers. The color of the white epoxy shall be a pure flat white, free of tints. The color of the yellow epoxy shall closely match Color Number 33538 of FS 595.

When the adhesion of the material to Portland cement concrete (the concrete shall have a minimum of 300-psi tensile strength) is tested according to American Concrete Institute Committee 403 testing procedure, the failure of the system must take place in the concrete. The concrete shall be 90 degrees F when the material is applied, after which the material shall be allowed to cure for 72 hours at 73, plus or minus 2, degrees F.

When the abrasion resistance of the material is tested according to ASTM C 501 with a CS-17 wheel under a load of 1000 grams for 1000 cycles, the wear index shall be no greater than 82. (The wear index is the weight in milligrams that is abraded from the sample under the test conditions).

The Type D durometer hardness of the material shall be not less than 75 nor more than 90 when tested according to ASTM D 2240 after the material has cured for 72 hours at 73, plus or minus 2, degrees F. The tensile strength of the material, when tested according to ASTM D 638, shall not be less than 6,000 psi after 72 hours cure time at 73, plus or minus 2, degrees F. The compressive strength of the material, when tested according to ASTM D 695, shall not be less than 12,000 psi after 72 hours cure time at 73, plus or minus 2, degrees F.

The individual components shall not require mixing prior to use when stored for a period of 12 months.

Type I material shall be in "no-tracking" condition in 15 minutes or less and within 45 minutes for Type II material. The "no-tracking" condition shall be determined on an application of specified thickness to the

pavement and covered with glass beads. The lines for this test shall be applied with striping equipment operated so as to have the material at manufacturer's recommended application temperature. This maximum "no-tracking" time shall not be exceeded when the pavement temperature varies from 50 to 120 degrees F and under all humidity conditions, providing the pavement is dry. The no-tracking time shall be determined by passing over the line with a passenger car or pickup truck at a speed of 25 to 35 mph in a simulated passing maneuver. A line showing no visual deposition of the material to the pavement surface when viewed from a distance of 50 feet shall be considered as showing "no-tracking" and conforming to this requirement for time to "no-track."

#### 2.1.1.2 Glass Beads

Glass beads shall meet the requirements of AASHTO M 247, have a roundness of at least 80 percent, and be of the type recommended by the manufacturer. The glass beads shall be applied at a rate of at least 25 lb./gal.

### PART 3 EXECUTION

#### 3.1 STANDARD PAVEMENT MARKING EXECUTION

All construction shall meet the requirements of the NDDOT SS.

#### 3.2 EPOXY PAVEMENT MARKING EQUIPMENT

Equipment furnished shall include an applicator truck of adequate size and power, designed to apply an epoxy resin material and glass reflectorizing beads in a continuous or intermittent line pattern. The equipment shall be capable of placing stripes on the left and right sides. The left carriage shall be capable of two lines simultaneously with either line in a solid or intermittent pattern in yellow or white. With change in color usage, an amount of material equal to fifteen 10 foot stripes shall be wasted to eliminate the change of the incorrect color being applied.

The applicator truck (striper) and other vehicles in the striping train shall have permanently mounted Type C flashing arrow boards. They shall be visible to oncoming or following traffic, depending on the type of line being placed. Arrow board requirements are detailed in the MUTCD (Manual on Uniform Traffic Control Devices). Also, truck equipment shall be capable of accumulating the footage applied per gun, individually each day. Only material application shall activate the footage accumulators. The readout shall be digital and not adjustable.

The equipment shall be capable of applying glass beads in a pressurized system at a rate of at least 25 lb./gal.

All guns on the spray carriages shall be in full view of the operator(s) during operation.

Each crew shall include at least one technical expert knowledgeable in equipment operation, application techniques, control of traffic, and safety regulations.

#### 3.3 EPOXY PAVEMENT MARKING PROCEDURES

The road surface shall be cleaned just prior to an application. Pavement cleaning shall consist of at least brushing with a rotary broom (non-metallic), or as recommended by the material manufacturer. New

Portland cement concrete surfaces shall be cleaned by sandblasting or shotblasting to remove any surface treatments and/or laitance. On low speed (speed limit 40 mph or less) urban Portland cement concrete roadways, sandblast or shotblast cleaning shall be used for all epoxy pavement markings.

If the roadway surface is dry, the epoxy material application shall immediately follow the pavement cleaning and be preceded by an air blast. However, markings shall not be applied when the wind or other conditions cause a film of dust to be deposited on the pavement surface before the material can be applied.

The Contractor will place necessary spotting at appropriate points as overall horizontal control for striping and to indicate necessary starting and cutoff points. Broken line intervals will not be marked. Longitudinal joints, pavement edges, and existing markings may serve as control points when so directed.

The epoxy pavement marking material will be applied at a thickness of 25 mils on new concrete surfaces and 20 mils on new asphalt surfaces (calculated without drop on glass beads). The minimum line width shall be its nominal width with 1/4 inch greater than the nominal width allowed provided the variation is gradual and does not detract from the general appearance. Alignment deviations from the control guide shall not exceed 2 inches. Material shall not be applied over a longitudinal joint. Establishment of application tolerances shall not relieve the Contractor of his responsibility to comply as closely as practicable with the planned dimensions.

#### 3.4 EPOXY PAVEMENT MARKING SPRAYING OPERATION

Placement of epoxy materials shall be permitted only on a clean, dry pavement surface and air and pavement temperatures at least 50 degrees F unless the manufacturer, in writing, approves a lower temperature.

Two parts of epoxy component A (pigment) and one part component B (hardener) shall be heated separately at 110, plus or minus 1, degrees F and thoroughly mixed. All material heated over 140 degrees F shall be discarded. The sprayed epoxy shall be applied at 110, plus or minus 1, degrees F or as recommended by the manufacturer.

Glass beads shall be applied immediately after the placement of the epoxy. The dispenser system must deliver at least 25 lbs. of beads per gallon of epoxy material.

Type II epoxy material shall be used for epoxy pavement markings except when specified as otherwise.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02770

CONCRETE SIDEWALKS AND CURBS AND GUTTERS

PART 1 GENERAL

1.1 REFERENCES

1.2 SUBMITTALS

PART 2 PRODUCTS

2.1 MATERIALS

PART 3 EXECUTION

3.1 GENERAL

3.2 SAMPLING AND TESTING

-- End of Section Table of Contents --

SECTION 02770

CONCRETE SIDEWALKS AND CURBS AND GUTTERS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

|                      |   |
|----------------------|---|
| NDDOT SS             | (1997) Standard Specifications for Road and Bridge Construction                     |
| NDDOT SS Section 748 | (1997) Standard Specifications for Road and Bridge Construction - Curbs and Gutters |
| NDDOT SS Section 750 | (1997) Standard Specifications for Road and Bridge Construction - Sidewalks         |
| NDDOT FSTM           | Field Sampling and Testing Manua  |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Sampling and Testing; FIO

Copies of all test reports within 24 hours of completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

All materials shall meet the requirements of the NDDOT SS Section 748 and NDDOT SS Section 750 and all other referenced sections and manuals indicated in NDDOT SS Section 748 and NDDOT SS Section 750.

PART 3 EXECUTION

3.1 GENERAL

All construction shall meet the requirements of the NDDOT SS.

3.2 SAMPLING AND TESTING



Grand Forks Phase 2 Levees

Sampling and testing shall be performed in accordance with NDDOT FSTM.

The following revisions are made to the referenced NDDOT FSTM, NDDOT SS Section 748 and NDDOT SS Section 750:

- a. Perform only 1 sieve analysis per source.
- b. No moisture test will be required.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02821

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, STORAGE, AND HANDLING
- 1.4 QUALITY ASSURANCE
  - 1.4.1 Required Report Data

PART 2 PRODUCTS

- 2.1 CHAIN-LINK FENCING AND ACCESSORIES
  - 2.1.1 Fabric
  - 2.1.2 Posts and Braces
  - 2.1.3 Fencing Accessories
  - 2.1.4 Concrete

PART 3 EXECUTION

- 3.1 SITE PREPARATION
  - 3.1.1 Clearing and Grading
  - 3.1.2 Excavation
- 3.2 FENCE INSTALLATION
  - 3.2.1 Post Spacing
  - 3.2.2 Post Setting
    - 3.2.2.1 Earth
  - 3.2.3 Bracing
  - 3.2.4 Top and Bottom Tension Wires
  - 3.2.5 Fabric
- 3.3 ACCESSORIES INSTALLATION
  - 3.3.1 Post Caps
- 3.4 CLEANUP

-- End of Section Table of Contents --

SECTION 02821

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

|               |   |
|---------------|---|
| FS RR-F-191   | (Rev. K) Fencing, Wire and Post Metal (and Gates, Chain-Link Fence Fabric, and Accessories) (General Specification) |
| FS RR-F-191/1 | (Rev. D) Fencing, Wire and Post, Metal (Chain-Link Fence Fabric) (Detail Specification)                             |
| FS RR-F-191/3 | (Rev. D) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces) (Detail Specification)        |
| FS RR-F-191/4 | (Rev. D) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories) (Detail Specification)                        |

1.2 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Fence

Fence dimensions, materials and finishes

Post anchorage details

Fence installation

SD-06 Instructions

Fence

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

## Grand Forks Phase 2 Levees

### 1.4 QUALITY ASSURANCE

#### 1.4.1 Required Report Data

Submit reports of listing of chain-link fencing and accessories regarding weight in ounces for zinc coating.

## PART 2 PRODUCTS

### 2.1 CHAIN-LINK FENCING AND ACCESSORIES

FS RR-F-191 and detailed specifications as referenced and other requirements as specified.

#### 2.1.1 Fabric

FS RR-F-191/1; Type I, zinc-coated steel, 9 gage. Mesh size, 2 inches. Provide selvage knuckled at both selvages. Fence height shall be 6 feet to top of mesh and framing.

#### 2.1.2 Posts and Braces

FS RR-F-191/3 line posts; Class 1, steel pipe, Grade B. End, corner, and pull posts; Class 1, steel pipe, Grade B. Braces; Class 1, steel pipe, Grade B.

#### 2.1.3 Fencing Accessories

FS RR-F-191/4. Provide wire ties constructed of the same material as the fencing fabric.

#### 2.1.4 Concrete

Provide as specified in Section 03300 CAST-IN-PLACE CONCRETE.

## PART 3 EXECUTION

### 3.1 SITE PREPARATION

#### 3.1.1 Clearing and Grading

Clear fence line of trees, brush, and other obstacles to install fencing. Establish a graded, compacted fence line prior to fencing installation. Compact fill used to establish fence line.

#### 3.1.2 Excavation

Excavate for concrete-embedded items in accordance with manufacturer's recommendations. Dispose of waste material as specified in Section 02300 EARTHWORK.

### 3.2 FENCE INSTALLATION

Install fence on prepared surfaces to line and grade indicated. Install fence in accordance with fence manufacturer's written installation instructions except as modified herein.

#### 3.2.1 Post Spacing

## Grand Forks Phase 2 Levees

Provide line posts spaced as shown on drawings. Provide corner or pull posts, with bracing in both directions for all posts.

### 3.2.2 Post Setting

Set posts plumb. Allow concrete to cure a minimum of 72 hours before performing other work on posts.

#### 3.2.2.1 Earth

Provide concrete bases of dimensions indicated. Compact concrete to eliminate voids, and finish to a dome shape.

### 3.2.3 Bracing

Brace corner, end, and pull posts to nearest post with a horizontal brace used as a compression member, placed at least 12 inches below top of fence, and a diagonal truss rod and truss tightener used as a tension member.

### 3.2.4 Top and Bottom Tension Wires

Install top and bottom tension wires before installing chain-link fabric, and pull wires taut. Place top and bottom tension wires within 8 inches of respective fabric line.

### 3.2.5 Fabric

Pull fabric taut and secure fabric to top wire and bottom wire, close to both sides of each post and at maximum intervals of 24 inches on center. Secure fabric to posts using stretcher bars, ties or clips spaced 15 inches on center, or by integrally weaving to integral fastening loops of end, corner and pull for full length of each post. Install fabric on opposite side of posts from area being secured. Install fabric so that bottom of fabric is 2 inches above ground level.

## 3.3 ACCESSORIES INSTALLATION

### 3.3.1 Post Caps

Install post caps as recommended by the manufacturer.

## 3.4 CLEANUP

Remove waste fencing materials and other debris from the station.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02824

ORNAMENTAL FENCE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 SPECIAL WARRANTY

PART 2 PRODUCTS

- 2.1 ORNAMENTAL PICKET FENCE
  - 2.1.1 Pickets
  - 2.1.2 Rails
  - 2.1.3 Posts
  - 2.1.4 Accessories
  - 2.1.5 Finish
- 2.2 GATES
- 2.3 ACCESSORIES
  - 2.3.1 Rail Attachment Brackets
  - 2.3.2 Industrial Drive Rivets
  - 2.3.3 Ornamental Picket Fence Accessories
  - 2.3.4 Post Caps
  - 2.3.5 Picket Tops
- 2.4 SETTING MATERIALS
  - 2.4.1 Flanged Posts

PART 3 EXECUTION

- 3.1 EXAMINATION
- 3.2 INSTALLATION
- 3.3 GATE INSTALLATION
- 3.4 ACCESSORIES
- 3.5 CLEANING

-- End of Section Table of Contents --

SECTION 02824

ORNAMENTAL FENCE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|            |  |
|------------|--|
| ASTM A 607 | (1998) Steel, Sheet and Strip, High-Strength, Low-Alloy, Columbian or Vandadium, or both, Hot-Rolled and Cold-Rolled |
| ASTM A 653 | (1999) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process         |
| ASTM A 787 | (1996) Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubin                                      |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Ornamental Picket Fence; GA

Manufacturer's catalog cuts indicating material compliance and specified options.

SD-04 Drawings

Ornamental Picket Fence; GA

Layout of fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.

SD-14 Samples

Color selection for PVC finishes; GA

If requested, samples of materials (e.g., fabric, wires and accessories).

### 1.3 SPECIAL WARRANTY

Provide manufacturer's standard limited warranty that its ornamental fence system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of 15 years from the date of purchase.

## PART 2 PRODUCTS

### 2.1 ORNAMENTAL PICKET FENCE

Ornamental picket fence style shall be as shown on Drawings. Fence shall be 6 feet in height.

#### 2.1.1 Pickets

Galvanized square steel tubular members manufactured in accordance with ASTM A 787, having a 45,000 psi yield strength and G90 zinc coating, 0.90 oz/f<sup>2</sup>. Minimum size of pickets shall be 1 inch. Attach each picket to each rail with 1/4-inch industrial drive rivets. Size #4. Minimum gauge wall thickness shall be 14 gauge.

#### 2.1.2 Rails

1-1/2 inches x 1-3/8 inches x 1-1/2 inches, 11-gauge thick galvanized steel "U" channel per ASTM A 653 or ASTM A 607, having a 50,000 psi yield strength and G90 zinc coating, 0.90 oz/f<sup>2</sup>. Punch rails to receive pickets and rivets and attach rails to rail brackets with 2 each, 1/4-inch industrial drive rivets. Size #4. Steel for rail produced under ASTM A 653.

#### 2.1.3 Posts

Galvanized square steel tubular members manufactured in accordance with ASTM A 787 having a 45,000 psi yield strength and G90 zinc coating, 0.90 oz/f<sup>2</sup>. Zinc coating is (inside and outside), (Posts zinc-coated outside and painted inside, is unacceptable). Minimum post size shall be 6 inches square, having 10-gauge wall thickness.

#### 2.1.4 Accessories

Assembled panels with ornamental accessories attached using industrial drive rivets to prevent removal and vandalism.

#### 2.1.5 Finish

All pickets, channels, posts, fittings and accessories shall be polyester coated individually after drilling and layout, to ensure maximum corrosion protection. (Coating of assembled sections is unacceptable). Components shall be given 4-stage "Power Wash" pre-treatment process to clean and prepare the galvanized surface to assure complete adhesion of the finish coat. Metal shall then be given polyester resin based power coating applied by the electrostatic spray process, to a 2.5 mils thickness. Finish shall then be baked in a 450-degree C (metal temperature) oven for 20 minutes.

### 2.2 GATES

Ornamental picket swing gates as specified in Section 02825 ORNAMENTAL PICKET SWING GATES.



## 2.3 ACCESSORIES

### 2.3.1 Rail Attachment Brackets

Brackets shall be die cast of zinc (ZAMAK #3 Alloy). Ball and socket design capable of 30-degree swivel (up/down - left/right). Bracket to fully encapsulate rail end for complete security.

### 2.3.2 Industrial Drive Rivets

Rivets shall be of sufficient length to attach items in a secure non-rattling position. Rivet to have a minimum of 1100 pounds (4894 N) holding power and a shear strength of 1500 pounds (6674 N).

### 2.3.3 Ornamental Picket Fence Accessories

Provide indicated items required to complete fence system. Galvanized each ferrous metal item in accordance with ASTM B 695 and finish to match framing.

### 2.3.4 Post Caps

Formed steel, cast of malleable iron or aluminum alloy, weather-tight closure cap. Provide one ball style post cap for each post.

### 2.3.5 Picket Tops

Pickets tops shall terminate inside of rail.

## 2.4 SETTING MATERIALS

### 2.4.1 Flanged Posts

Provide flange type base plates with 4 holes for surface mounting of posts where indicated.

## PART 3 EXECUTION

### 3.1 EXAMINATION

Verify areas to receive fencing are completed to final grades and elevations. Ensure property lines and legal boundaries of work are clearly established.

### 3.2 INSTALLATION

Install fence in accordance with manufacturer's instructions. Surface mount with lag bolts and shields. Check each post for vertical and top alignment, and maintain in position during placement and finishing operation. Align fence panels between posts. Firmly attach rail brackets to posts with 1/4-inch bolt and lock nut, ensuring panels and posts remain plumb. Attach securely to concrete slab with expansion bolts.

### 3.3 GATE INSTALLATION

Install gates plumb, level and secure for full opening without interference. Attach hardware by means that will prevent unauthorized removal. Adjust hardware for smooth operation.

3.4 ACCESSORIES

Install post caps and other accessories to complete fence.

3.5 CLEANING

Clean up debris and unused material, and remove from site.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02825

ORNAMENTAL SWING GATE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 MANUFACTURER'S QUALIFICATIONS

PART 2 PRODUCTS

- 2.1 ORNAMENTAL PICKET SWING GATE
  - 2.1.1 Gate Frames
  - 2.1.2 Ornamental Picket Infill
  - 2.1.3 Bracing
  - 2.1.4 Hardware Materials
  - 2.1.5 Hinges
  - 2.1.6 Latch
  - 2.1.7 Keeper
  - 2.1.8 Double Gates
  - 2.1.9 Gate Posts
  - 2.1.10 Polyester Powder Coat Finish
- 2.2 SETTING MATERIAL
  - 2.2.1 Concrete

PART 3 EXECUTION

- 3.1 EXAMINATION
- 3.2 ORNAMENTAL PICKET GATE FRAMING INSTALLATION
- 3.3 GATE INSTALLATION
- 3.4 CLEANING

-- End of Section Table of Contents --

SECTION 02825

ORNAMENTAL SWING GATE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 787 (1996) Electric-Resistance-Welded  
Metallic-Coated Carbon Steel Mechanical  
Tubin

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Ornamental Picket Swing Gate; GA

Manufacturer's catalog cuts indicating material compliance and specified options.

SD-04 Drawings

Ornamental Picket Swing Gate; GA

Layout of fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.

SD-14 Samples

Color selection for polymer finshes; GA

If requested, samples of materials.

1.3 MANUFACTURER'S QUALIFICATIONS

Products from qualified manufacturers having a minimum of 5 years experience Manufacturing ornamental picket fencing will be acceptable by the architect as equal, if approved in writing, ten days prior to bidding, and if they meet the following specifications for design, size, gauge of metal parts and fabrication.

PART 2 PRODUCTS

## Grand Forks Phase 2 Levees

### 2.1 ORNAMENTAL PICKET SWING GATE

#### 2.1.1 Gate Frames

Fabricate ornamental picket swing gate using galvanized steel members, structural quality steel, 45,000 psi tensile strength, with galvanized G90 coating. Frame members welded using stainless steel welded to form rigid one-piece unit. Minimum size vertical uprights, 2-inch square 13 gauge wall thickness.

#### 2.1.2 Ornamental Picket Infill

"U" channel rails, formed from hot rolled, structural steel, 1-3/8 inches wide x 1-1/2 inches deep, 11-gauge wall thickness. Punch rails to receive pickets, and weld inside gate frame. Pickets, galvanized steel, 1-inch square tube of gauge, spacing, and with accessories to match fence. Attach pickets to "U" rails by 1/4-inch industrial drive rivets, Size #4.

#### 2.1.3 Bracing

Provide diagonal adjustable length truss rods on gates to prevent sag.

#### 2.1.4 Hardware Materials

Galvanized steel or malleable iron shapes to suit gate size.

#### 2.1.5 Hinges

Hinges shall be structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180 degrees .

#### 2.1.6 Latch

Latch shall be capable of retaining gate in closed position and have provision for padlocking.

#### 2.1.7 Keeper

Provide keeper for each gate leaf over 5 feet wide. Gatekeeper shall consist of mechanical device for securing free end of gate when in full open position.

#### 2.1.8 Double Gates

Provide drop rod to hold inactive leaf. Provide gate stop pipe to engage center drop rod. Provide locking device and padlock eyes as an integral part of latch, requiring one padlock for locking both gate leaves.

#### 2.1.9 Gate Posts

6-inch square members, ASTM A 787, structural quality steel 45,000 psi tensile strength, with galvanized G90 coating.

#### 2.1.10 Polyester Powder Coat Finish

After components have been galvanized to provide maximum corrosion resistance, pretreat, clean, and prepare galvanized surface to assure complete adhesion of finish coat. Apply 2.5-mil thickness of polyester

resin-based powder coating by electrostatic spray process. Bake finish for 20 minutes at 450 degrees F , metal temperature.

## 2.2 SETTING MATERIAL

### 2.2.1 Concrete

Minimum 28-day compressive strength of 3,000 psi.

## PART 3 EXECUTION

### 3.1 EXAMINATION

Verify areas to receive fencing are completed to final grades and elevations. Ensure property lines and legal boundaries of work are clearly established.

### 3.2 ORNAMENTAL PICKET GATE FRAMING INSTALLATION

Install gate posts in accordance with manufacturer's instructions. Attach gate post securely to concrete slab with flange-type base plate with 4 holes and expansion anchors.

### 3.3 GATE INSTALLATION

Install gates plumb, level and secure for full opening without interference. Attach hardware by means that will prevent unauthorized removal. Adjust hardware for smooth operation.

### 3.4 CLEANING

Clean up debris and unused material, and remove from site.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02832

SEGMENTAL CONCRETE BLOCK RETAINING WALL

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 DEFINITIONS
- 1.3 SUBMITTALS
- 1.4 SEGMENTAL RETAINING WALL DESIGN
  - 1.4.1 Design
    - 1.4.1.1 External Stability Design Requirements
    - 1.4.1.2 Global Stability Design Requirements
  - 1.4.2 Layout
- 1.5 CONTRACTOR QUALIFICATIONS
- 1.6 SUPPLIER QUALIFICATIONS
- 1.7 MANUFACTURER'S REPRESENTATIVE
- 1.8 DELIVERY, STORAGE AND HANDLING
  - 1.8.1 Segmental Concrete Units and Wall Caps
  - 1.8.2 Geosynthetic Labeling
  - 1.8.3 Geosynthetic Handling
  - 1.8.4 Geosynthetic Storage

PART 2 PRODUCTS

- 2.1 SEGMENTAL CONCRETE UNITS
  - 2.1.1 Architectural requirements
  - 2.1.2 Structural requirements
  - 2.1.3 Wall Caps
- 2.2 REINFORCEMENT
  - 2.2.1 Geogrid Reinforcement
  - 2.2.2 Reinforcement Properties
    - 2.2.2.1 Long Term Design Strength
- 2.3 GEOTEXTILE FILTER
- 2.4 SOILS AND AGGREGATES
- 2.5 MASONRY ADHESIVE
- 2.6 DRAINAGE PIPE

PART 3 EXECUTION

- 3.1 CLASSIFICATION OF SOIL MATERIALS
- 3.2 EARTHWORK
  - 3.2.1 Excavation
  - 3.2.2 Stockpiles
- 3.3 LEVELING PAD
  - 3.3.1 Aggregate Base Leveling Pad
  - 3.3.2 Concrete Leveling Pad
- 3.4 BLOCK INSTALLATION
- 3.5 REINFORCEMENT INSTALLATION
- 3.6 FILL PLACEMENT

Grand Forks Phase 2 Levees

- 3.7    COMPACTION
  - 3.7.1   Degree of Compaction
  - 3.7.2   Moisture Control
  - 3.7.3   Compaction
- 3.8    SOIL TESTING
  - 3.8.1   General
  - 3.8.2   Transmittal
  - 3.8.3   Corrective Action
  - 3.8.4   Testing Schedule
- 3.9    REINFORCEMENT TESTING
- 3.10   DRAINAGE PIPE
- 3.11   CONSTRUCTION TOLERANCES
- 3.12   PROTECTION OF WORK

-- End of Section Table of Contents --



SECTION 02832

SEGMENTAL CONCRETE BLOCK RETAINING WALL

PART 1 GENERAL

This work element includes engineering in addition to the construction requirements. The NCMA design method for segmental retaining walls considers potential failure modes categorized by external, internal, local, compound, and global stability. The Government has considered the global and external stability and has provided the minimum design requirements on the drawings. The Contractor is responsible for engineering services that include analysis of the wall for all modes of stability, and providing shop drawings indicating all features of the complete design.

1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 252 (1996) Corrugated Polyethylene Drainage  
Tubing

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136 (1996a) Sieve Analysis of Fine and Coarse  
Aggregates

ASTM C 140 (2001) Sampling and Testing Concrete  
Masonry Units

ASTM C 920 (1998) Elastomeric Joint Sealants

ASTM C 1262 (1997) Evaluating the Freeze-Thaw  
Durability of Manufactured Concrete  
Masonry Units and Related Concrete Units

ASTM C 1372 (1997) Segmental Retaining Wall Units

ASTM D 448 (1986; R 1993) Sizes of Aggregate for Road  
and Bridge Construction

ASTM D 698 (1998) Laboratory Compaction  
Characteristics of Soil Using Standard  
Effort (12,400 ft-lbf/cu. ft. (600  
kN-m/cu. m.))

ASTM D 1241 (1968; R 1994) Materials for  
Soil-Aggregate Subbase, Base, and Surface

Courses

|             |  |
|-------------|--|
| ASTM D 1556 | (1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method  |
| ASTM D 2487 | (1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)                                     |
| ASTM D 2488 | (1993) Description and Identification of Soils   |
| ASTM D 2922 | (1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)  |
| ASTM D 4355 | (1999) Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)                      |
| ASTM D 4595 | (1986; R 1994) Tensile Properties of Geotextiles by the Wide-Width Strip Method  |
| ASTM D 4873 | (2001) Identification, Storage, and Handling of Geosynthetic Rolls   |
| ASTM D 5321 | (1992) Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method |

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

|                |   |
|----------------|---|
| FHWA SA-96-071 | (1997) Mechanically Stabilized Earth Walls and Reinforced Soil Slopes: Design and Construction Guidelines |
|----------------|---|

GEOSYNTHETIC INSTITUTE (GSI)

|             |   |
|-------------|---|
| GSI GRI GG1 | (1988) Geogrid Rib Tensile Strength   |
| GSI GRI GG5 | (1991) Geogrid Pullout  |
| GSI GRI GG6 | (1992) Grip Types for Use in the Wide Width Testing of Geotextiles and Geogrids |
| GSI GRI GT6 | (1992) Geotextile Pullout   |

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)

|                 |  |
|-----------------|--|
| NCMA SRWU-1     | (1997) Determination of Connection Strength between Geosynthetics and Segmental Concrete Units |
| NCMA SRWU-2     | (1997) Determination of Shear Strength between Segmental Concrete Units                        |
| NCMA SRW Manual | (1997) Design Manual for Segmental Retaining Walls, 2nd Editio                                 |

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

NDDOT SS Section 858 (1997) Geotextile Fabric  
1.2 DEFINITIONS

- a. Blocks. Segmental concrete retaining wall units will be referred to as blocks.
- b. Drainage Aggregate. Granular soil or aggregate which is placed within, between, and/or immediately behind segmental concrete units.
- c. Fill. Soil or aggregate placed in, behind, or below the wall will be referred to as fill.
- d. Reinforced Fill. Soil which is placed and compacted within the neat line volume of reinforcement as outlined on the plans.
- e. Retained Fill. Soil which is placed and compacted behind the reinforced fill.
- f. Reinforcement. Reinforcement shall consist of a geogrid or a geotextile product manufactured for use as reinforcing. Reinforcement shall not include steel products.
- g. Long Term Design Strength. The long term design strength (LTDS) is:

$$LTDS = \tau_{ul} / (R^F * R^I * R^C)$$

where:

$\tau_{ul}$  is the ultimate strength  
 $R^F$  is the reduction factor for chemical and biological durability  
 $R^I$  is the reduction factor for installation damage  
 $R^C$  is the reduction factor for creep

1.3 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Manufacturer's Data; GA

The Contractor shall submit descriptive technical data on the blocks, wall caps, masonry adhesive, reinforcement and geotextile filter materials. The submittal shall include all material properties specified under paragraph PRODUCTS. The submittal shall also include a copy of any standard manufacturer's warranties for the products.

Qualifications; GA

The Contractor shall provide documentation showing that the installer and supplier meet the qualifications listed.

## Grand Forks Phase 2 Levees

Soil Testing; FIO  
Reinforcement Testing; FIO

The Contractor shall submit testing data specific to the blocks and reinforcement to be supplied.

a. The shear strength between blocks shall be established in accordance with NCMA SRWU-2.

b. The connection strength between the blocks and the reinforcement shall be established in accordance with NCMA SRWU-1. If the FHWA design method is used, the modifications in FHWA SA-96-071 shall be implemented.

c. The coefficient for direct shear of the reinforcement on a soil similar in gradation and texture to the material that will be used for fill in the reinforced zone shall be established in accordance with ASTM D 5321.

d. The coefficient of interaction for pull-out resistance of the reinforcement in a soil similar in gradation and texture to the material that will be used for fill in the reinforced zone shall be established in accordance with GSI GRI GG5 or GSI GRI GT6.

Calculations; GA

The Contractor shall submit a calculation of the long term design strength for the reinforcement in accordance with the NCMA or FHWA design method. The ultimate strength or index strength shall be based on the minimum average roll value tensile strength of the product using the wide width strength test in ASTM D 4595 or the single rib test in GSI GRI GG1. The calculation shall itemize each reduction factor and include backup data to justify each reduction factor.

The Contractor shall submit design calculations, including computer output data and program documentation. The calculations shall include all items described under PARAGRAPH: SEGMENTAL RETAINING WALL DESIGN.

### SD-04 Drawings

Shop Drawings; GA

The fabrication and installation drawings shall be submitted. The shop drawings shall include all items described under paragraph SEGMENTAL RETAINING WALL DESIGN. If approved by the Contracting Officer, shop drawings may consist of marked up contract drawings showing exact dimensions for the blocks supplied, required coping, and other minor revisions.

### SD-13 Certificates

Reinforcement; FIO

The Contractor shall submit an affidavit certifying that the reinforcement meets the project specifications. The affidavit shall be signed by an official authorized to certify on behalf of the manufacturer and shall be accompanied by a mill certificate

that verifies physical properties were tested during manufacturing and lists the manufacturer's quality control testing. If the affidavit is dated after award of the contract and/or is not specific to the project, the supplier shall attach a statement certifying that the affidavit addressed to the wholesale company is representative of the material supplied. The documents shall include a statement confirming that all purchased resin used to produce reinforcement is virgin resin. The mill certificate shall include the tensile strength tested in accordance with either ASTM D 4595 or GSI GRI GG1.

#### SD-14 Samples

##### Segmental Concrete Units; GA

The Contractor shall submit two samples of each proposed block. Each sample shall be typical of the size, texture, color, and finish.

##### Reinforcement; GA

The Contractor shall submit samples of each type of reinforcement. The samples shall be labeled and have a minimum size 8 by 10 inches. Geogrid shall include at least 2 apertures (3 junctions) in each direction.

#### 1.4 SEGMENTAL RETAINING WALL DESIGN

The Contractor shall complete all stability analyses in accordance with either the NCMA SRW Manual, or the Federal Highway Administration/AASHTO method detailed in FHWA SA-96-071. Only one method shall be followed for the complete design, including reinforcement design strength, layout, stability calculations, and seismic effects. The segmental retaining wall system shall be designed under the direction of, and be signed by, a professional engineer.

##### 1.4.1 Design

Calculations shall include determination of long term design strength of reinforcement specific to this project in accordance with the NCMA SRW Manual or FHWA SA-96-071. Calculations shall include analysis of all failure modes listed in the NCMA SRW Manual. Design calculations shall include a clear outline of material properties and assumptions. The Contractor shall use the following soil parameters and water elevation for stability analysis, and shall select additional soil parameters as required to complete the analysis.

##### Reinforced Fill

Moist Unit Weight, 120 pcf  
Saturated Unit Weight, 125 pcf  
Internal Friction Angle, 30 degrees  
Cohesion, 0 psf  
Water Elevation, 2 feet above grade in front of wall

##### Retained Fill

Moist Unit Weight, 115 pcf  
Saturated Unit Weight, 116 pcf

Internal Friction Angle, 30 degrees  
Cohesion, 200 psf  
Water Elevation, Top of Fill

Foundation Soil

Moist Unit Weight, 115 pcf  
Saturated Unit Weight, 116 pcf  
Internal Friction Angle, 30 degrees  
Cohesion, 0 psf

1.4.1.1 External Stability Design Requirements

As a minimum requirement, the length of the reinforcing at the base of the wall shall not be less than 0.7 times the total height of the blocks.

1.4.1.2 Global Stability Design Requirements

Reinforcement lengths shall be no less than the lengths shown on the drawings.

1.4.2 Layout

Shop drawings shall reflect all information needed to fabricate and erect the walls including the leveling pad elevations; the shape and dimensions of wall elements; the number, size, type, and details of the soil reinforcing system and anchorage; and identification of areas requiring coping. The design and layout of the internal reinforcement shall be subject to the following:

- a. All features indicated in the contract documents shall be incorporated in the final design and construction.
- b. The leveling pad elevations may vary, but shall be no higher than the embedment depth profile shown
- c. Each reinforcement level shall run as continuous as practical throughout the profile. If a geotextile filter is present, the reinforcement shall be laid out so that interference with the geotextile is minimized.
- d. Any reinforcement not placed with the machine direction as the design reinforcement direction shall be identified on the shop drawings.
- e. Reinforcement attached to the wall facing shall not combine geogrid and geotextile, nor products from different manufacturers, within one wall. The number of reinforcement products shall be limited to avoid confusion in placement. For walls under 12 feet high, all reinforcement shall be the same grade and strength (i.e. design with one reinforcement strength).

1.5 CONTRACTOR QUALIFICATIONS

The job foreman or the company directly responsible for the wall installation shall have completed a minimum of 10 segmental concrete retaining wall projects.

1.6 SUPPLIER QUALIFICATIONS

Suppliers of segmental retaining wall system components shall have demonstrated experience in the supply of similar size and types of segmental retaining walls on previous projects.

#### 1.7 MANUFACTURER'S REPRESENTATIVE

The Contractor shall have a qualified and experienced representative from the block and reinforcement manufacturer available on an as-needed basis during the wall construction. The representative shall visit the site for consultation at least once during construction and as requested by the Contracting Officer.

#### 1.8 DELIVERY, STORAGE AND HANDLING

The Contractor shall check products upon delivery to assure that the proper material has been received and is undamaged. For geosynthetics, the guidelines presented in ASTM D 4873 shall be followed.

##### 1.8.1 Segmental Concrete Units and Wall Caps

The Contractor shall protect blocks from damage and exposure to cement, paint, excessive mud, and like materials. The Contractor shall check materials upon delivery to assure that the block dimensions are within the tolerances specified.

##### 1.8.2 Geosynthetic Labeling

Each roll shall be labeled with the manufacturer's name, product identification, roll dimensions, lot number, and date manufactured.

##### 1.8.3 Geosynthetic Handling

Geosynthetic rolls shall be handled and unloaded by hand, or with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Geosynthetic rolls shall not be dragged, lifted by one end, lifted by cables or chains, or dropped to the ground.

##### 1.8.4 Geosynthetic Storage

Geosynthetics shall be protected from cement, paint, excessive mud, chemicals, sparks and flames, temperatures in excess of 160 degrees F, and any other environmental condition that may degrade the physical properties.

If stored outdoors, the rolls shall be elevated from the ground surface. Geosynthetics, except for extruded grids, shall be protected with an opaque waterproof cover. Geosynthetics shall be delivered to the site in a dry and undamaged condition. Geotextiles shall not be exposed to direct sunlight for more than 7 days.

## PART 2 PRODUCTS

### 2.1 SEGMENTAL CONCRETE UNITS

#### 2.1.1 Architectural requirements

- a. Face color - Natural Limestone.
- b. Face Texture - split face typical of broken mortar.
- c. Face Appearance - single-surface face/sculptured with 3-surface

beveled face/rounded.

d. Batter - Blocks shall be engaged to the block below by use of keys, lips, pins, clips, or other reliable mechanism to provide a consistent wall batter between 1H:6V and 1H:16V.

e. Block Size - a minimum of 2/3 square feet of face area, and minimum 6 inch height.

f. Bond configuration - Beveled or sculptured face blocks shall be designed to stack with a half-bond (joints located at midpoint of vertically adjacent blocks). The block edges shall be finished so that vertical joints are flush.

#### 2.1.2 Structural requirements

The blocks shall be manufactured to the requirements of ASTM C 1372, except for the following modifications:

a. Minimum 28-day compressive strength of 5800 psi, based on net area in accordance with ASTM C 140.

b. A maximum moisture absorption rate of 5%, in accordance with ASTM C 140.

c. The minimum oven dry density of concrete shall be 125 pcf.

d. The blocks shall provide a minimum of 80 pounds per square foot of wall face area (determined without void filling).

e. For freeze-thaw durability tested in accordance with ASTM C 1262, specimens shall comply with either of the following: (1) the weight loss of each of 5 specimens after 40 cycles shall not exceed 1 percent; or (2) the weight loss of 4 out of 5 specimens after 50 cycles shall not exceed 1.5 percent.

#### 2.1.3 Wall Caps

Segmental concrete block units shall be placed as caps on top of all segmental concrete retaining walls. The cap blocks shall have a color and texture on exposed faces to match that of the other blocks and meet the requirements for the other blocks except that the minimum height shall be 3 inches. Each cap block shall have abutting edges saw cut or formed to provide tight, flush abutting joints with no gaps in the joints when placed end to end in the alignment shown on the drawings.

### 2.2 REINFORCEMENT

#### 2.2.1 Geogrid Reinforcement

Geogrid shall be a geosynthetic manufactured for reinforcement applications. The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil, aggregate, or other fill materials. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. The geogrid shall be manufactured with 100 percent virgin resin consisting of polyethylene, polypropylene, or polyester, and with a maximum of 5 percent in-plant regrind material.



Polyester resin shall have a minimum molecular weight of 25,000 and a carboxyl end group number less than 30. Polyethylene and polypropylene shall be stabilized with long term antioxidants.

#### 2.2.2 Reinforcement Properties

The reinforcement shown in the approved shop drawing submittal shall meet the long term design strength requirements used in the design, and shall meet the properties listed in Table 1. Reinforcement strength requirements represent minimum average roll values in the machine direction.

TABLE 1. REINFORCEMENT PROPERTIES

| PROPERTY                               | REQUIREMENT                | TEST DESIGNATION           |
|--|----------------------------|----------------------------|
| Long Term Design Strength              | 400 lb/inch                | NCMA SRW Manual, Method A  |
| UV Resistance                          | 70 percent after 500 hours | ASTM D 4355                |
| Coefficient of Interaction for Pullout | 0.7                        | GSI GRI GG5 or GSI GRI GT6 |
| Coefficient for Direct Shear           | 35 degrees                 | ASTM D 5321                |

##### 2.2.2.1 Long Term Design Strength

The long term design strength shall be based on reduction factors for installation damage and durability that are applicable to the fill that will be used. Minimum reduction factors for durability include: 1.1 for polyethylene and polypropylene geosynthetics, and 1.15 for coated polyester geogrids. The creep reduction factor must be consistent with the test procedure used for determining the ultimate strength.

#### 2.3 GEOTEXTILE FILTER

Geotextile shall meet the requirements of NDDOT SS Section 858, geotextile fabric for separation (Type S1).

#### 2.4 SOILS AND AGGREGATES

All material placed as fill shall consist of material classified by ASTM D 2487 as GW, GP, GC, GM, SP, SM, SC, CL, ML, or SW. The material shall be free of ice; snow; frozen earth; trash; debris; sod; roots; organic matter; contamination from hazardous, toxic or radiological substances; or stones larger than 3 inches in any dimension. Each material shall be obtained entirely from one borrow source, unless the Contracting Officer determines that quality control is adequate and the alternate source produces material that is similar in gradation, texture, and interaction with the reinforcement. The Contractor shall supply any testing required by the Contracting Officer to evaluate alternate sources. All materials shall be of a character and quality satisfactory for the purpose intended.

- a. Drainage Aggregate shall meet the requirements of ASTM D 448, size

No.7.

b. Aggregate Base material for the wall leveling pads shall meet the requirements of ASTM D 1241, gradation C.

c. Reinforced Fill. Soil placed in the reinforced fill zone shall consist of granular material with less than 5% passing the No. 200 sieve.

d. Retained Fill. Impervious and select impervious fill, reference Section 02300 EARTHWORK.

## 2.5 MASONRY ADHESIVE

The masonry adhesive shall meet the following requirements:

- a. ASTM C 920, Type S, Grade NS, Class 25
- b. expected 30 year life
- c. meet the recommendations of the block manufacturer

## 2.6 DRAINAGE PIPE

The drainage pipe shall be corrugated polyethylene pipe meeting requirements of AASHTO M 252.

## PART 3 EXECUTION

### 3.1 CLASSIFICATION OF SOIL MATERIALS

Classification of soil materials shall be performed by the Contractor in accordance with ASTM D 2488. The Contracting Officer reserves the right to revise the Contractor classifications. In the case of disagreement, the Contracting Officer's classification will govern unless the soils are classified in accordance with ASTM D 2487. All testing completed by the Contractor in conjunction with soil material classification will be considered incidental to the contract work.

### 3.2 EARTHWORK

The leveling pad and reinforced fill zone shall bear on undisturbed native soils, or acceptably placed and compacted fill. In the event that it is necessary to remove material to a depth greater than specified or to place fill below the leveling pad not otherwise provided for in the contract, the Contracting Officer shall be notified prior to work and an adjustment in the contract price will be considered in accordance with the contract. Additional work not authorized by the Contracting Officer shall be at the Contractor's expense.

#### 3.2.1 Excavation

Foundation soil shall be excavated as required for leveling pad dimensions and reinforcement placement shown on the construction drawings. Material for backfilling shall be stockpiled in a neat and orderly manner at a sufficient distance from the banks of the excavation to avoid overloading and to prevent slides or caving. Excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. The Contractor is responsible for disposal of surplus material, waste material, and material that does not meet specifications, including any soil which is disturbed by the Contractor's operations or softened due to exposure to the

elements and water.

### 3.2.2 Stockpiles

Stockpiles of all material to be incorporated into the work shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed. Topsoil shall be stockpiled separately from suitable backfill material. Stockpiles of aggregates and granular soils shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes frozen, saturated, intermixed with other materials, or otherwise out of specification or unsatisfactory for the use intended, such material shall be removed and replaced with new material from approved sources at no additional cost to the Government.

### 3.3 LEVELING PAD

#### 3.3.1 Aggregate Base Leveling Pad

The subgrade below the leveling pad shall be compacted with at least 3 passes with a vibratory plate compactor with an operating weight not less than 450 pounds. The aggregate base material shall be placed in lifts not exceeding 6 inches and compacted with at least 3 passes with a vibratory plate compactor. If the subgrade or aggregate base pumps, bleeds water, or cracks during compaction, the Contracting Officer shall be notified and, if no other changes are directed, the aggregate shall be replaced with a concrete leveling pad.

#### 3.3.2 Concrete Leveling Pad

Tolerances in screeding shall be sufficient to place the blocks directly on the leveling pad without mortar, pointing, or leveling course between the blocks and leveling pad.

### 3.4 BLOCK INSTALLATION

The wall system components shall be constructed in accordance with the wall supplier's recommendations and construction manual. Damaged blocks shall not be incorporated in the retaining wall.

a. Block placement shall begin at the lowest leveling pad elevation. The blocks shall be in full contact with the leveling pad. Each course of block shall be placed sequentially for the entire wall alignment to maintain a level working platform for layout of reinforcement and placement of fill.

b. The grade and alignment of the first course shall be surveyed and the results furnished to the Contracting Officer prior to placing the second course. Survey control for alignment shall include a string line, offset from a base line, or suitable provisions that can be reproduced for quality assurance.

c. The blocks shall be placed with the edges in tight contact. No gap shall be allowed for wall batter and curvature. The vertical joints shall be maintained with a minimum 4 inch overlap on the underlying block. Coping required to keep block alignment shall be done with a full depth saw cut. No splitting shall be allowed.

d. Stacking of blocks prior to filling any lower course of block with drainage aggregate will not be allowed.

e. Cap units and the top two course of blocks shall be joined using masonry adhesive. Care shall be taken to keep adhesive from coming into contact with the face of wall units.

### 3.5 REINFORCEMENT INSTALLATION

a. Before placing reinforcement, the subgrade or subsequent lift of fill shall be compacted and graded level with the top of the blocks. The surface shall be smooth and free of windrows, sheepfoot impressions, and rocks.

b. Reinforcement shall be placed at the elevations and to the extent shown on the construction drawings and the approved shop drawing submittal. Reinforcement shall be oriented with the design strength axis perpendicular to the wall face. Each segment of reinforcement shall be continuous. Spliced connections between shorter pieces of reinforcement will not be allowed. Reinforcement strips shall be placed immediately next to adjacent strips to provide 100 percent coverage.

c. The reinforcement shall be installed in tension. The reinforcement shall be pulled taut and anchored with staples or stakes prior to placing the overlying lift of fill. The tension shall be uniform along the length of the wall and consistent between layers.

d. All reinforcement shall be 100% covered by soil so that reinforcement panels do not contact in overlaps. Where the wall bends, a veneer of fill shall be placed to a nominal thickness of 3 inches to separate overlapping reinforcement.

### 3.6 FILL PLACEMENT

a. Fill placement, including drainage aggregate, shall be completed to the top of each course of facing blocks prior to stacking the subsequent course of blocks

b. Reinforced fill shall be placed from the wall back toward the fill area to ensure that the reinforcement remains taut. Fill shall be placed, spread, and compacted in such manner that minimizes the development of wrinkles in or movement of the reinforcement.

c. A minimum fill thickness of 6 inches is required prior to operation of vehicles over the reinforcement. Sudden braking and sharp turning shall be avoided. Tracked equipment shall not turn within the reinforced fill zone to prevent tracks from displacing the fill and damaging the reinforcement. Construction equipment shall not be operated directly upon the reinforcement as part of the planned construction sequence. Rubber tired equipment may operate directly on the reinforcement if: the Contractor submits information documenting testing of equipment operating on a similar geogrid product on similar soils, the travel is infrequent, equipment travels slow, turning is minimized, and no damage or displacement to the reinforcement is observed.

d. Drainage aggregate shall be placed and tamped directly behind, between, and within the cells of the facing units. Compaction of the

drainage aggregate shall be achieved by at least two passes on each lift with a vibratory plate compactor. Care shall be taken not to contact or chip the blocks with the compactor. Aggregate placed within the block cores and recesses shall be compacted by hand tamping and rodding.

e. At the end of each day, the Contractor shall slope the last lift of fill away from the wall in a manner that will allow drainage and direct runoff away from the wall face.

### 3.7 COMPACTION

Fill shall not be placed on surfaces that contain mud, frost, organic soils, fill soils that have not met compaction requirements, or where the Contracting Officer determines that unsatisfactory material remains in or under the fill. Fill shall be spread and compacted in lifts not exceeding the height of one course of blocks.

#### 3.7.1 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698. The maximum density is hereafter abbreviated as the "Standard Proctor" value.

#### 3.7.2 Moisture Control

Control of moisture in the fill shall be maintained to provide acceptable compaction. Disking and plowing will not be allowed in the reinforced fill zone. Moisture content of cohesive soils shall be adjusted at the borrow source before placement. Adding water directly to the reinforced fill zone shall only be conducted under conditions where the soil has sufficient porosity and capillarity to provide uniform moisture throughout the fill during compaction.

#### 3.7.3 Compaction

Reinforced fill shall be compacted to 95 percent of the Standard Proctor Density. Care shall be exercised in the compaction process to avoid misalignment of the facing blocks. Heavy compaction equipment (including vibratory drum rollers) shall not be used within 3 feet from the wall face.

### 3.8 SOIL TESTING

#### 3.8.1 General

All testing expenses shall be the Contractor's responsibility. Prior to sampling and testing the work, testing laboratories shall be inspected and approved in accordance with Section 01451, CONTRACTOR QUALITY CONTROL. The Contracting Officer reserves the right to direct the location and select the material for samples to be tested and to direct where and when moisture-density tests shall be performed. Nuclear density testing equipment shall be used in general accordance with ASTM D 2922.

#### 3.8.2 Transmittal

The Contracting Officer shall be informed of test results daily for direction on corrective action required. Draft copies of field testing results shall be furnished to the Contracting Officer on a frequent and regular basis, as directed.

### 3.8.3 Corrective Action.

Tests of materials which do not meet the contract requirements (failing test) will not be counted as part of the required testing. Each such failing test must be retaken at the same location as the failing test was taken. If testing indicates material does not meet the contract requirements, the material represented by the failing test shall not be placed in the contract work or shall be recompact or removed. The quantity of material represented by the failing test shall be determined by the Contracting Officer up to the quantity represented by the testing frequency. The Contractor may increase testing frequency in the vicinity of a failing test in order to reduce removal requirements, as approved by the Contracting Officer. Such increases in testing frequency shall be at the Contractor's expense and at no additional cost to the Government.

### 3.8.4 Testing Schedule

Moisture-Density Relations (ASTM D 698)

One test for each material variation.

In-Place Densities (ASTM D 1556 or ASTM D 2922)

Not less than 1 test for each 2 vertical feet per 300 linear feet along wall face.

Sieve Analysis, (ASTM C 136)

(1) Drainage Aggregate, 1 test for each source.

### 3.9 REINFORCEMENT TESTING

All testing expenses shall be the Contractor's responsibility. Testing shall be performed by a commercial testing laboratory selected by the Contractor and approved by the Contracting Officer or performed by the Contractor if approved by the Contracting Officer. The Contracting Officer reserves the right to direct the location and select the material for samples

TABLE 3. REINFORCEMENT TESTING

| PROPERTY                             | TEST DESIGNATION | FREQUENCY                      |
|--------------------------------------|------------------|--------------------------------|
| Wide Width Strip<br>Tensile Strength | ASTM D 4595      | 2 Tests per reinforcement type |
| or                                   |                  |                                |
| Single Rib<br>Tensile Strength       | GSI GRI GG1      | 2 Tests per reinforcement type |

ASTM D 4595 shall be modified for geogrids considering recommendations in GSI GRI GG6; and the tensile strength shall be expressed on a unit length basis by substituting  $n \cdot a$  for  $W_s$ , where:

$W_s$  = specimen width, (inches)  
 $n$  = number of ribs in the sample (must be a whole number)  
 $a$  = nominal rib spacing for the product tested, (inches)

### 3.10 DRAINAGE PIPE

Drain pipe shall be placed as indicated on the drawings. Drain lines shall be laid to true grades and alignment with a continuous fall in the direction of flow. The interior of the pipe shall be kept clean from soil and debris; and open ends shall be temporarily capped as necessary.

### 3.11 CONSTRUCTION TOLERANCES

- a. Horizontal: The top of wall shall be within 3 inches of the plan location.
- b. Vertical: The top of wall elevations shall be within 0.1 feet above to 0.1 feet below the prescribed top of wall elevations shown on the drawings.
- c. Plumbness and Alignment: The wall batter and alignment offset measured as deviation from a straight edge shall be within plus or minus 1.25 inches per 10 feet section. The batter measured from vertical shall be within 2 degrees of the plan dimension.
- d. Block Defects: The blocks will be accepted on the basis of tolerances specified in ASTM C 1372.
- e. Block Gaps: Gaps between adjacent blocks shall not exceed 1/8 inches.

### 3.12 PROTECTION OF WORK

Work shall be protected against damage from subsequent operations. Disturbed or displaced blocks shall be removed and replaced to conform to all requirements of this section. Damaged material shall not be incorporated into the wall. Upon completion of wall erection, the Contractor shall clean the wall face to remove any loose soil deposits or stains.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02870

SITE FURNISHINGS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, STORAGE, AND HANDLING
- 1.4 INSPECTION

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Concrete
  - 2.1.2 Masonry
  - 2.1.3 Metal
    - 2.1.3.1 Steel
    - 2.1.3.2 Reinforcing Steel
    - 2.1.3.3 Cast Iron
    - 2.1.3.4 Cast Aluminum
    - 2.1.3.5 Bronze, Copper and Other Ounce Metals
  - 2.1.4 Wood
    - 2.1.4.1 Treatment
    - 2.1.4.2 Selection
  - 2.1.5 Recycled Material
    - 2.1.5.1 General Requirements
    - 2.1.5.2 High Density Polyethylene
    - 2.1.5.3 Structural Component
  - 2.1.6 Fiberglass
- 2.2 HARDWARE
- 2.3 ANCHORS
- 2.4 FINISH
  - 2.4.1 Coatings
    - 2.4.1.1 Galvanizing
    - 2.4.1.2 Polyester Powder
    - 2.4.1.3 Polyvinyl-chloride (PVC)
  - 2.4.2 Paint
- 2.5 SITE FURNISHING STANDARDS
  - 2.5.1 Benches
  - 2.5.2 Trash Receptacles
  - 2.5.3 Bollards
  - 2.5.4 Signs

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Parts
  - 3.1.2 Assembly
  - 3.1.3 Testing



Grand Forks Phase 2 Levees

- 3.2 RESTORATION AND CLEAN UP
  - 3.2.1 Clean Up
  - 3.2.2 Protection
  - 3.2.3 Disposal of Materials
- 3.3 RE-INSTALLATION

-- End of Section Table of Contents --

SECTION 02870

SITE FURNISHINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications shall be referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |   |
|-------------------|---|
| ASTM A 36/A 36M   | (1997ael) Carbon Structural Steel   |
| ASTM A 48M        | (1994ael) Gray Iron Castings (Metric)   |
| ASTM A 123/A 123M | (2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products                              |
| ASTM A 153/A 153M | (1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware  |
| ASTM A 500        | (1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes        |
| ASTM A 501        | (1999) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing                              |
| ASTM A 615/A 615M | (1996ael) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement                         |
| ASTM B 26/B 26M   | (1999) Aluminum-Alloy Sand Castings   |
| ASTM B 62         | (1993) Composition Bronze or Ounce Metal Castings   |
| ASTM B 108        | (1999) Aluminum-Alloy Permanent Mold Castings   |
| ASTM C 150        | (1999a) Portland Cement   |
| ASTM D 648        | (1998c) Deflection Temperature of Plastics Under Flexural Load                                    |
| ASTM D 2990       | (1995) Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics                     |
| ASTM F 1487       | (1998) Standard Consumer Safety Performance Specification for Playground Equipment for Public Use |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

#### Site Furnishings; GA

Manufacturer's descriptive data and catalog cuts.

#### Installation; GA

Manufacturer's installation and maintenance instructions.

#### Materials; GA

A listing indicating the furnishings provided have been in proven satisfactory use for at least 2 years.

### SD-04 Drawing .

#### Site Furnishing Standards; GA

Drawings showing scaled details of proposed site furnishings, elevations for each type of site furnishing; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction.

### SD-09 Reports

#### Recycled Material; GA

A report of site furnishing parts consisting of recycled materials. Product specification data shall provide test information for deflection and creep in accordance with ASTM D 648 and ASTM D 2990 for site furnishings which use plastic lumber as a component, shall be submitted. The data shall provide a comparison of deflection and creep measurements to other comparable materials.

### SD-14 Samples

#### Finish; GA

Two sets of color data for each furnishing displaying manufacturer's color selections and finishes, and identifying those colors and finishes proposed for use.

### SD-18 Records

#### Testing; GA

A report of post-installation test results.

## 1.3 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered, handled, and stored in accordance with the

manufacturer's recommendations. The storage area shall be as designated. The materials shall be stored in a dry, covered area until installed.

#### 1.4 INSPECTION

Site furnishings shall be inspected upon arrival at the job site for conformity to specifications and quality in accordance with paragraph MATERIALS. Unacceptable items shall be removed from the job site.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

Materials shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory use for at least 2 years.

##### 2.1.1 Concrete

Portland cement shall conform to ASTM C 150 Types I, II, or III.

##### 2.1.2 Masonry

Masonry material and products shall conform to Section 04200 MASONRY.

##### 2.1.3 Metal

Metallic materials and products shall conform to Section 05500 MISCELLANEOUS METAL. Metal components shall be furnished with factory drilled holes. Components shall be free of excess weld and spatter. Metal components with holes that will not be filled by hardware or hidden by other components will be rejected.

##### 2.1.3.1 Steel

Structural steel products shall conform to ASTM A 36/A 36M, ASTM A 500 and ASTM A 501.

##### 2.1.3.2 Reinforcing Steel

Steel used for reinforcement shall be deformed billet steel Grade 40. Steel shall conform to ASTM A 615/A 615M.

##### 2.1.3.3 Cast Iron

Cast iron shall conform to ASTM A 48M Class 35 or better. The Contractor shall provide castings manufactured true to pattern and component parts that fit together in a satisfactory manner. Castings shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects. Smooth castings shall be well-cleaned by sand or shot blasting.

##### 2.1.3.4 Cast Aluminum

Cast aluminum shall conform to ASTM B 26/B 26M and ASTM B 108. The Contractor shall provide castings manufactured true to pattern and component parts that fit together in a satisfactory manner. Castings shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects. Smooth castings shall be

well-cleaned by sand or shot blasting.

#### 2.1.3.5 Bronze, Copper and Other Ounce Metals

Bronze, copper, and other ounce metals shall conform to ASTM B 62.

#### 2.1.4 Wood

The Contractor shall provide premium grade wood free of knots; boards with eased edges and ends; and wood components with factory drilled holes. Components with holes that will not be filled by hardware or hidden by other components will be rejected.

##### 2.1.4.1 Treatment

Wood that is not naturally rot and insect resistant shall be treated with standard procedures. Creosote, pentachlorophenol, tributyl tin oxide shall not be used in conformance with ASTM F 1487. Ammonium Copper Quat (ACQ) shall not be used for surfaces likely to contact the skin of small children.

##### 2.1.4.2 Selection

Wood products shall be selected to withstand the climatic conditions of the region in which the site is located.

#### 2.1.5 Recycled Material

##### 2.1.5.1 General Requirements

Recycled materials shall contain a minimum 85 percent recycled post-consumer product. Recycled materials shall be constructed or manufactured with a maximum 1/4 inch deflection or creep in any member in conformance with ASTM D 648 and ASTM D 2990.

##### 2.1.5.2 High Density Polyethylene

The Contractor shall provide panels and components molded of ultraviolet (UV) and color stabilized polyethylene, with minimum 1/4 inch wall thickness; exposed edges shall be smoothed, rounded, and free of burrs and points; and the material shall be resistant to fading, cracking, fogging, and shattering. The material shall be non-toxic and have no discernible contaminants such as paper, foil, or wood. The material shall contain no more than 3 percent air voids. Material shall be resistant to deformation from solar radiation heat gain.

##### 2.1.5.3 Structural Component

Recycled materials to include plastic lumber will not be used as structural components of site furnishings.

#### 2.1.6 Fiberglass

Fiberglass shall consist of at least 3 laminations of chopped glass fibers impregnated with polyester resin, with colors and textures molded into all exposed surfaces so that colors resist fading. Fiberglass shall be resistant to cleaners, fertilizers, high power spray and salt.

#### 2.2 HARDWARE

Hardware shall be stainless steel or galvanized steel in accordance with ASTM A 153/A 153M and compatible with the material to which applied. All exposed hardware shall match in color and finish. Mounting hardware shall be concealed, recessed, and plugged.

## 2.3 ANCHORS

Anchors shall be provided, where necessary, for fastening site furnishings securely in place and in accordance with approved manufacturer's instructions. Anchoring devices that may be used, when no anchors are otherwise specified or indicated, include anchor bolts, slotted inserts, expansion shields for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; and lag bolts and screws for wood.

## 2.4 FINISH

Finish shall be as specified by the manufacturer or as indicated. Exposed surfaces and edges shall be rounded, polished, or sanded. Finish shall be non-toxic, non-glare, and resistant to corrosion. Exposed surfaces shall be smooth and splinter-free exposed surfaces.

### 2.4.1 Coatings

#### 2.4.1.1 Galvanizing

Galvanized components shall be hot-dipped in zinc after fabrication in accordance with ASTM A 123/A 123M. Tailings and sharp protrusions formed as a result of the hot-dip process shall be removed and exposed edges burnished.

#### 2.4.1.2 Polyester Powder

Powder-coated surfaces shall receive electrostatic zinc coating prior to painting. Powder coating shall be electrostatically applied and oven cured. Polyester powder coating shall be resistant to ultraviolet (UV) light.

#### 2.4.1.3 Polyvinyl-chloride (PVC)

PVC coating shall be primed with a clear acrylic thermosetting solution. The primed parts shall be preheated prior to dipping. The liquid polyvinyl chloride shall be ultraviolet (UV) stabilized and mold-resistant. The coated parts shall be cured. The coating shall be a minimum 2/25 inches thick plus or minus 0.020 inches and shall have an 85 durometer hardness with a slip-resistant finish.

### 2.4.2 Paint

Paint shall be factory applied with a minimum of 2 coats. Paint shall be weather-resistant and resistant to cracking, peeling and fading.

## 2.5 SITE FURNISHING STANDARDS

Site furnishings shall be furnished with the dimensions and requirements indicated.

### 2.5.1 Benches

- a. Type "B" Bench: DuMor Recycled Plastic Bench Model 32PL

(62-489-6PL), 6 feet, or approved equal. Surface mount, recycled plastic slats in 'Cedar', 'Brown' polyester powder-coat finish and fixed arm for ADA accessibility.

- b. Type "C" Bench: DuMor Recycled Plastic Glider Bench Model 30PL (62-745-6PL), 6 feet, or approved equal. Surface mount, recycled plastic slats in 'Cedar', 'Brown' polyester powder-coat finish and fixed arm for ADA accessibility.
- c. Contact: Nancy Teel, Earl F. Andersen Company, Phone: 952-884-7300, Fax: 952-884-5619.

#### 2.5.2 Trash Receptacles

- a. Type "A" Trash Can: DuMor Trash Receptacle Model 124-31PL, or approved equal. 'Cedar' recycled plastic slats, surface mount, 'Brown' polyester powder-coat finish.
- b. Contact: Nancy Teel, Earl F. Andersen Company, Phone: 952-884-7300, Fax: 952-884-5619.

#### 2.5.3 Bollards

- a. Type "B" Bollard: Timberform Recycled Plastic Removable Bollard, Model 2553-3-R, or approved equal. Color shall be "Cedar". Government to specify arrow direction.
- b. Type "C" Bollard: Timberform Recycled Plastic Bollard, Model 2553-3-E, or approved equal. Color shall be "Cedar". Government to specify arrow direction.
- c. Contact: John Masciopinto, Park and Plaza Products, Inc., Phone: 651-653-0556, Fax: 651-653-0598.

#### 2.5.4 Signs

- a. Best Signs Custom Regulatory Signage, or approved equal. See drawings for signage type and quantity. Contact: Paula, Construction Supply, Inc., Phone: 763-537-5018.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

The Contractor shall verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings. Site furnishings shall be installed plumb and true in accordance with the approved manufacturer's instructions.

##### 3.1.1 Parts

New parts shall be acquired from the manufacturer. Substitute parts will not be accepted unless approved by the manufacturer.

##### 3.1.2 Assembly

When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall

not interfere with other operations or pedestrian and vehicular circulation.

### 3.1.3 Testing

Each site furnishing shall be tested to determine a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: The Contractor shall measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. A written report describing the results of the testing shall be provided.

## 3.2 RESTORATION AND CLEAN UP

When the installation has been completed, the Contractor shall clean up and protect the site. Existing areas that have been damaged from the installation operation shall be restored to original condition at Contractor's expense.

### 3.2.1 Clean Up

The site shall be cleaned of all materials associated with the installation. Site furnishing surfaces shall be cleaned of dirt, stains, filings, and other blemishes occurring from shipment and installation. Cleaning methods and agents shall be according to manufacturer's instructions or as indicated.

### 3.2.2 Protection

The area shall be protected as required or directed by providing barricades and signage. Signage shall be in accordance with Section 10430 EXTERIOR SIGNAGE.

### 3.2.3 Disposal of Materials

Excess and waste material shall be removed and disposed off Government property.

## 3.3 RE-INSTALLATION

Where re-installation is required, the following shall be accomplished:

- a. Re-install the product as specified. Material acquisition of replacement parts is the responsibility of the Contractor. Provide replacement materials that are new and supplied by the original manufacturer to match.
- b. Damage caused by the failed installation shall be repaired.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02915

TRANSPLANTING EXTERIOR PLANT MATERIAL

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 TRANSPLANTING PLAN
- 1.4 PLANT MATERIAL SURVIVABILITY
- 1.5 DECIDUOUS TREES
  - 1.5.1 Single stem
    - 1.5.1.1 Specimen
  - 1.5.2 Protection During Transplanting
- 1.6 DELIVERY OF MATERIALS
  - 1.6.1 Delivered Topsoil
  - 1.6.2 Soil Amendments
  - 1.6.3 Pesticide Material
- 1.7 PLANT MATERIAL IDENTIFICATION
- 1.8 INSPECTION OF MATERIALS
- 1.9 STORAGE OF MATERIALS
- 1.10 HANDLING OF MATERIALS
- 1.11 TIME LIMITATION
- 1.12 WARRANTY

PART 2 PRODUCTS

- 2.1 TOPSOIL
- 2.2 SOIL AMENDMENTS
  - 2.2.1 pH Adjuster
  - 2.2.2 Limestone
  - 2.2.3 Hydrated Lime
  - 2.2.4 Burnt Lime
  - 2.2.5 Fertilizer
  - 2.2.6 Organic Material
    - 2.2.6.1 Bonemeal
    - 2.2.6.2 Rotted Manure
    - 2.2.6.3 Decomposed Wood Derivatives
    - 2.2.6.4 Recycled Compost
    - 2.2.6.5 Worm Castings
  - 2.2.7 Soil Conditioner
    - 2.2.7.1 Sand
    - 2.2.7.2 Super Absorbent Polymers
    - 2.2.7.3 Calcined Clay
    - 2.2.7.4 Gypsum
    - 2.2.7.5 Expanded Shale, Clay, or Slate (ESCS)
- 2.3 MULCH
  - 2.3.1 Shredded Bark
- 2.4 GEOSYNTHETICS
- 2.5 METAL STAKING AND GUYING MATERIAL

## Grand Forks Phase 2 Levees

- 2.5.1 Bracing Stakes
- 2.5.2 Metal Ground Stakes
- 2.5.3 Earth Anchor
- 2.5.4 Guying Material
- 2.5.5 Turnbuckle
- 2.6 RUBBER GUYING MATERIAL
- 2.7 FLAG
- 2.8 MYCORRHIZAL FUNGI INOCULUM
- 2.9 WATER
- 2.10 PESTICIDE

## PART 3 EXECUTION

- 3.1 TRANSPLANTED PLANT MATERIAL TIME AND CONDITIONS
  - 3.1.1 Deciduous Plant Material Time
  - 3.1.2 Transplanting Conditions
  - 3.1.3 Underground Utilities
  - 3.1.4 Protecting Existing Vegetation
  - 3.1.5 Installing Site Tests
    - 3.1.5.1 Percolation Test
    - 3.1.5.2 Soil Test
  - 3.1.6 Plant Material Preparation and Handling
    - 3.1.6.1 Root Pruning
    - 3.1.6.2 Plant Material Preparation
    - 3.1.6.3 Tree Spading
    - 3.1.6.4 Caliper
- 3.2 INSTALLING SITE PREPARATION
  - 3.2.1 Finished Grade and Topsoil
  - 3.2.2 Layout
- 3.3 INSTALLING SITE EXCAVATION
  - 3.3.1 Obstructions Below Ground
  - 3.3.2 Turf Removal and Replacement
  - 3.3.3 Plant Pits
- 3.4 INSTALLATION
  - 3.4.1 Setting Plant Material
  - 3.4.2 Root Barriers
  - 3.4.3 Backfill Soil Mixture
  - 3.4.4 Adding Mycorrhizal Fungi Inoculum
  - 3.4.5 Backfill Procedure
    - 3.4.5.1 Earth Berm
  - 3.4.6 Plant Bed
  - 3.4.7 Watering
  - 3.4.8 Staking and Guying
    - 3.4.8.1 One Bracing Stake
    - 3.4.8.2 Two Bracing Stakes
    - 3.4.8.3 Three Ground Stakes
  - 3.4.9 Deadmen or Earth Anchors
  - 3.4.10 Flags
- 3.5 FINISHING
  - 3.5.1 Plant Material
  - 3.5.2 Placing Geosynthetics
  - 3.5.3 Placing Mulch
  - 3.5.4 Pruning
- 3.6 MAINTENANCE DURING TRANSPLANTING OPERATION
- 3.7 RESTORATION AND CLEAN UP
  - 3.7.1 Restoration
  - 3.7.2 Backfill Removal Site Plant Pits
  - 3.7.3 Clean Up
- 3.8 PLANT ESTABLISHMENT PERIOD

## Grand Forks Phase 2 Levees

- 3.8.1 Commencement
- 3.8.2 Maintenance During Establishment Period
  - 3.8.2.1 Weeding
  - 3.8.2.2 Post-Fertilization
  - 3.8.2.3 Plant Pit Settling
  - 3.8.2.4 Removal Site Settlement
  - 3.8.2.5 Maintenance Record
- 3.8.3 Acceptable Plant Material
- 3.8.4 Unhealthy Or Dead Plant Material
  - 3.8.4.1 Transplant Shock
  - 3.8.4.2 Dead Plant Material
  - 3.8.4.3 Replacement Plant Material
- 3.8.5 Maintenance Instructions
- 3.8.6 End of Establishment Period Clean Up

-- End of Section Table of Contents --

SECTION 02915

TRANSPLANTING EXTERIOR PLANT MATERIAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)

ANLA Z60.1 (1996) Nursery Stock

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A300 (1995) Tree Care Operations - Trees, Shrubs and other Woody Plant Maintenance

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602 (1995a) Agricultural Liming Materials

ASTM D 3776 (1996) Mass per Unit Area (Weight) of Fabric

ASTM D 4491 (1999a) Water Permeability of Geotextiles by Permittivity

ASTM D 4533 (1991; R 1996) Trapezoid Tearing Strength of Geotextiles

ASTM D 4632 (1991; R 1997) Grab Breaking Load and Elongation of Geotextiles

ASTM D 4751 (1999a) Determining Apparent Opening Size of a Geotextile

ASTM D 4833 (2001) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

ASTM D 4873 (2001) Identification, Storage, and Handling of Geosynthetic Rolls

ASTM D 4972 (1995a) pH of Soils

ASTM D 5034 (1995) Breaking Strength and Elongation of Textile Fabrics (Grab Test)

ASTM D 5035 (1995) Breaking Force and Elongation of Textile Fabrics (Strip Method)

|             |  |
|-------------|--|
| ASTM D 5268 | (1992; R 1996) Topsoil Used for Landscaping Purposes   |
| ASTM D 5883 | (1996el) Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purpose |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

#### Geosynthetics; GA

Manufacturer's literature including physical characteristics, application and installation instructions.

#### Equipment; GA

A listing of equipment to be used for the transplanting operation, including size model, year and type of mechanical tree transplanting equipment.

#### Transplanting Plan; GA

Methods to be used for each plant species to be transplanted ensuring survivability.

#### Plant Establishment Period; GA

Calendar time period for the plant establishment period. When there is more than one establishment period, the boundaries of the planted areas covered for each period shall be described.

#### Maintenance Record; GA

Maintenance work performed, quantity of plant losses, and replacements; and diagnosis of unhealthy plant material.

### SD-04 Drawings

Finished Grade and Topsoil; GA  
Underground Utilities; GA  
Delivered Topsoil; GA  
Obstructions Below Ground; GA

Finished grade status; location of underground utilities and facilities; and availability of topsoil from the stripping and stock piling operation.

### SD-09 Reports

Soil Test; GA  
Percolation Test; GA

Recycled Compost; GA

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-13 Certificates

Topsoil; GA  
Fertilizer; GA  
Soil Conditioner; GA  
pH Adjuster; GA

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following.

For items listed in this section:

- 1) Certification of recycled content or,
- 2) Statement of recycled content.
- 3) Certification of origin including the name, addresses and telephone number of manufacturer.
  - a. Topsoil. Particle size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.
  - b. Fertilizer. Chemical analysis and composition percent.
  - c. Soil Conditioner. Composition and source.
  - d. pH Adjuster. Calcium carbonate equivalent and sieve analysis.
  - e. Pesticide. EPA registration number and registered uses.

SD-19 Operation and Maintenance Manuals

Maintenance Instructions; GA

Instruction for care of installed plant material during initial establishment period and long term care.

1.3 TRANSPLANTING PLAN

A transplanting plan shall be submitted and shall delineate methods and times for root pruning, digging, balling, removing, storing, transporting, planting, watering, and maintenance to ensure survivability. The plan shall also include equipment, anti-desiccant and pesticides to be used. A listing of the plant material to be transplanted shall be provided by common name and botanical name as listed under "Nomenclature" in ANLA Z60.1 ; classification; caliper; and height.

1.4 PLANT MATERIAL SURVIVABILITY

Plant material survivability shall be determined by growing condition; root

pruning and transplanting method to maintain a healthy root system; and recovery of leaves or needles with the crown in good balance with the trunk free from disfigurement or abrasion.

#### 1.5 DECIDUOUS TREES

A "P1" height to caliper relationship shall be maintained in accordance with ANLA Z60.1. Height of branching shall bear a relationship to the size and species of tree and with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

##### 1.5.1 Single stem

The trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader. The form of growth desired shall be as indicated.

##### 1.5.1.1 Specimen

The tree shall be well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be as indicated.

##### 1.5.2 Protection During Transplanting

Plant material shall be protected during transplanting to prevent desiccation and damage to the branches, trunk, and root system. Branches shall be protected by tying-in. Exposed branches shall be covered during transport. The root area shall be treated with gels containing mycorrhizal fungi inoculum. Plant material shall be undamaged, well shaped, vigorous and healthy with a well-branched root system, free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement or abrasion after transplanting. Plant material showing desiccation, abrasion, sun scald injury or structural branching damage shall be replaced at no cost to the government.

#### 1.6 DELIVERY OF MATERIALS

##### 1.6.1 Delivered Topsoil

Prior to the delivery of any topsoil, the availability of topsoil shall be verified in paragraph TOPSOIL. A soil test shall be provided for delivered topsoil.

##### 1.6.2 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

##### 1.6.3 Pesticide Material

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration number and the manufacturer's registered uses.

#### 1.7 PLANT MATERIAL IDENTIFICATION

Plant material to be transplanted shall be tagged and/or shown on drawings.

Transplanted plant material shall be delivered with attached, durable, waterproof labels and weather-resistant ink or imprinted tags, stating the correct botanical plant name and size.

#### 1.8 INSPECTION OF MATERIALS

Materials shall be inspected for compliance with paragraph PRODUCTS, paragraph PLANT MATERIAL SURVIVABILITY and paragraph PLANT MATERIAL IDENTIFICATION. Open soil amendment containers or wet soil amendments shall be rejected. Topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material larger than 1-1/2 inch diameter shall be rejected. Topsoil that contains viable plant material and plant parts shall be rejected. Unacceptable material shall be removed from the job site.

#### 1.9 STORAGE OF MATERIALS

Storage of material shall be in designated areas. Soil amendments shall be stored in dry locations and away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with planting operation material.

#### 1.10 HANDLING OF MATERIALS

Materials shall not be dropped from vehicles. Plant material shall be transported without scarring trunks or deforming crown branching. Materials found to be in unacceptable condition shall be replaced at no additional cost to the Government.

#### 1.11 TIME LIMITATION

The time limitation from digging, removing, transporting, to installing transplanted plant material shall be the same day. The time limitation between installing the plant material and placing the mulch shall be a maximum 48 hours.

#### 1.12 WARRANTY

Transplanted plant material shall have a warranty for survivability as defined in paragraph PLANT MATERIAL SURVIVABILITY, and plant growth to be in a vigorous growing condition for a minimum 6 month period for plants other than specimen trees and a minimum 12 month calendar time period for specimen trees. The warranty of plant growth shall be provided regardless of the contract time period. When the transplanted plant material is determined to be unhealthy in accordance with paragraph PLANT ESTABLISHMENT PERIOD, it shall be replaced once under this warranty.

### PART 2 PRODUCTS

#### 2.1 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300 EARTHWORK. When additional topsoil is required beyond the available topsoil from the stripping operation, topsoil shall be delivered and amended as recommended by the soil test for the plant material specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter. Topsoil shall be free from viable plants and



plant parts.

## 2.2 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite is not permitted.

### 2.2.1 pH Adjuster

The pH adjuster shall be an agricultural liming material in accordance with ASTM C 602. These materials may be burnt lime, hydrated lime, ground limestone, or shells. The pH adjuster shall be used to create a favorable soil pH for the plant material specified.

### 2.2.2 Limestone

Limestone material shall contain a minimum calcium carbonate equivalent of 80 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 55 percent shall pass through a No. 60 sieve. To raise soil pH, ground limestone shall be used.

### 2.2.3 Hydrated Lime

Hydrated lime shall contain a minimum calcium carbonate equivalent of 110 percent. Gradation: A minimum 100 percent shall pass through a No. 8 sieve and a minimum 97 percent shall pass through a No. 60 sieve.

### 2.2.4 Burnt Lime

Burnt lime shall contain a minimum calcium carbonate equivalent of 140 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 35 percent shall pass through a No. 60 sieve.

### 2.2.5 Fertilizer

The nutrients ratio shall be 5 percent nitrogen, 10 percent phosphorus, and 5 percent potassium. Fertilizer shall be controlled release, commercial grade, suitable for use on newly transplanted plant material; free flowing, pellet or tablet form; uniform in composition; and consistent with a prescribed nitrogen-phosphorus-potassium ratio.

### 2.2.6 Organic Material

Organic material shall consist of either bonemeal, peat, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

#### 2.2.6.1 Bonemeal

Bonemeal shall be a finely ground, steamed bone product containing from a minimum 2 to a maximum 4 percent nitrogen and a minimum 16 to a maximum 40 percent phosphoric acid.

#### 2.2.6.2 Rotted Manure

Rotted manure shall be unleached horse, chicken, or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. Manure shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and

shall be free of stones, sticks, and soil.

#### 2.2.6.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, or other wood waste material free of stones, sticks, and toxic substances harmful to plants, and stabilized with nitrogen.

#### 2.2.6.4 Recycled Compost

Compost shall be a well-decomposed, stable, weed free organic matter source. It shall be derived from food, agricultural, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess between a minimum 5.5 to a maximum 8.0 pH, and have a moisture content between a minimum 35 and a maximum 55 percent by weight. The material shall not contain more than a maximum 1 percent by weight of man-made foreign matter. Compost shall be cleaned of plastic materials a minimum 2 inches in length.

#### 2.2.6.5 Worm Castings

Worm castings shall be screened from worms and food source and shall be commercially packaged.

#### 2.2.7 Soil Conditioner

Soil conditioner shall be sand, super absorbent polymers, calcined clay, or gypsum for single use or in combination to meet topsoil requirements for the plant material specified.

##### 2.2.7.1 Sand

Sand shall be clean and free of toxic materials. Gradation: A minimum 95 percent by weight shall pass a No. 10 sieve and a minimum 10 percent by weight shall pass a No. 16 sieve. Greensand shall be balanced with the inclusion of trace minerals and nutrients.

##### 2.2.7.2 Super Absorbent Polymers

To improve water retention in soils, super absorbent polymers shall be sized at a maximum 1000 microns. Polymers shall be added as a soil amendment and be cross-linked polyacrylamide with an absorption capacity of a minimum 250 to a maximum 400 times its weight.

##### 2.2.7.3 Calcined Clay

Granular particles shall be produced from montmorillonite clay calcined to a minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent passing No. 8 sieve; a minimum 99 percent shall be retained on No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

##### 2.2.7.4 Gypsum

Gypsum shall be commercially packaged, free flowing, and a minimum 95

percent calcium sulfate by volume.

#### 2.2.7.5 Expanded Shale, Clay, or Slate (ESCS)

Rotary kiln produced ESCS material shall be in conformance with ASTM D 5883.

### 2.3 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region. Rotted manure is not recommended to be used as a mulch because it would encourage surface rooting of the plant material and weeds.

#### 2.3.1 Shredded Bark

Locally shredded material shall be treated to retard the growth of mold and fungi.

### 2.4 GEOSYNTHETICS

Geosynthetics shall be defined as a product manufactured in accordance with ASTM D 3776, ASTM D 4491, ASTM D 4533, ASTM D 4632, ASTM D 4751, ASTM D 4833 and ASTM D 4873, ASTM D 5034 or ASTM D 5035. It shall be referred to as products manufactured for use as weed barriers, drainage matting, root barriers, or soil enhancement systems.

### 2.5 METAL STAKING AND GUYING MATERIAL

Metal shall be aluminum or steel consisting of recycled content made for holding plant material in place.

#### 2.5.1 Bracing Stakes

Metal bracing stakes may be hollow or solid and shall be a minimum 1 inch diameter and a minimum 8 feet long. Stake shall be set without damaging rootball and be capable of supporting the tree adequately.

#### 2.5.2 Metal Ground Stakes

Metal ground stakes shall be a minimum 1/2 inch diameter and a minimum 3 feet long.

#### 2.5.3 Earth Anchor

Metal earth anchors shall be a minimum 1/2 inch diameter and a minimum 2 feet long.

#### 2.5.4 Guying Material

Metal guying material shall be a minimum 12 gauge wire. Multi-strand cable shall be woven wire. Guying material tensile strength shall conform to the size of tree to be held firmly in place.

#### 2.5.5 Turnbuckle

Metal turnbuckles shall be galvanized or cadmium-plated steel, and shall be a minimum 3 inches long with closed screw eyes on each end. Screw thread tensile strength shall conform to the size of tree to be held firmly in place.

## 2.6 RUBBER GUYING MATERIAL

Rubber chafing guards, consisting of recycled material, shall be used to protect tree trunks and branches when metal guying material is applied. The material shall be the same color throughout the project. Length shall be a minimum 1.5 times the circumference of the plant trunk at its base.

## 2.7 FLAG

Plastic flag material shall be used on guying material. It shall be a minimum 6 inches long. Tape color shall be consistent and visually complimentary to the entire project area. The tape color shall meet pedestrian visual safety requirements for day and night.

## 2.8 MYCORRHIZAL FUNGI INOCULUM

Mycorrhizal fungi inoculum shall be composed of multiple-fungus inoculum as recommended by the manufacturer for the plant material specified.

## 2.9 WATER

Unless otherwise directed, water shall be the responsibility of the Contractor. Water shall be potable or supplied by an existing irrigation system.

## 2.10 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

# PART 3 EXECUTION

## 3.1 TRANSPLANTED PLANT MATERIAL TIME AND CONDITIONS

### 3.1.1 Deciduous Plant Material Time

Deciduous plant material shall be transplanted from April 1 to June 15 and August 15 to November 1.

### 3.1.2 Transplanting Conditions

All transplanting operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to all transplanting operations, proposed transplanting times shall be submitted for approval. The installing site for the plant material shall be prepared and excavated in accordance with paragraph INSTALLING SITE PREPARATION and paragraph INSTALLING SITE EXCAVATION, prior to removing the plant material.

### 3.1.3 Underground Utilities

The location of underground utilities and facilities at both the removal and installing sites shall be verified and marked. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

#### 3.1.4 Protecting Existing Vegetation

When there are established lawns at both the removal and installing sites, the turf shall be covered and/or protected during the operation. Existing trees, shrubs, and plant beds at both the removal and installing site that are to be preserved shall be barricaded along the dripline. The area shall be barricaded and protected from damage by a tree barricade or other measure. Damage to existing plant material shall be mitigated by the Contractor at no additional cost to the Government. Damage shall be assessed by a state certified arborist or other approved professional using the National Arborist Association's tree valuation guideline.

#### 3.1.5 Installing Site Tests

##### 3.1.5.1 Percolation Test

Test for percolation shall be done to determine positive drainage of plant pits and beds at the installing site. A positive percolation shall consist of a minimum 1 inch per 3 hours; when a negative percolation test occurs, a shop drawing shall be submitted indicating the corrective measures.

##### 3.1.5.2 Soil Test

Delivered topsoil, excavated plant pit soil, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection onsite shall be random over the entire installing site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the plant material to be transplanted.

#### 3.1.6 Plant Material Preparation and Handling

##### 3.1.6.1 Root Pruning

Large canopy and specimen plant material shall be root pruned a minimum of one year before transplanting. Minimum root ball sizes shall be in accordance with ANLA Z60.1. Medium sized plant material shall be spaded or hand dug prior to removal. A sharp spade shall be used to cut straight down a minimum of 18 inches deep.

##### 3.1.6.2 Plant Material Preparation

Plant material designated for transplanting shall be watered thoroughly several days before root pruning, digging or moving. Broken or interfering growth shall be pruned. Large canopy and specimen plant material shall be wire balled and burlapped. Trees shall be lifted by the use of tree straps. Canopy and evergreen trees up to a maximum 12 inches caliper shall be transplanted by the largest available tree spade in order to reduce shock. The installing site for the plant material shall be prepared and excavated in accordance with paragraphs: Transplanting Plant Material Time and Conditions, Installing Site Preparation, and Installing Site Excavation, prior to moving the plant material.

##### 3.1.6.3 Tree Spading

The following minimum size spades shall be used for trees sized as measured at caliper; 6 inches above the ground for trees 4 inches in diameter or smaller, 12 inches above the ground for trees with a larger diameter.

| Tree Spade Size | Deciduous Tree                           |
|-----------------|--|
| Minimum 44 inch | Minimum 2 inch to Maximum 3 inch caliper |
| Minimum 66 inch | Minimum 3 inch to Maximum 5 inch caliper |
| Minimum 85 inch | Minimum 6 inch to Maximum 8 inch caliper |

#### 3.1.6.4 Caliper

The caliper shall be measured at a minimum 6 inch height above the ground surface for trees up to a maximum 4 inch caliper. The caliper shall be measured at a minimum 12 inch height above the ground surface for trees with a larger caliper.

### 3.2 INSTALLING SITE PREPARATION

#### 3.2.1 Finished Grade and Topsoil

The Contractor shall verify that finished grades are as indicated on drawings, and that the placing of topsoil, the smooth grading, and the compaction requirements have been completed in accordance with Section 02300 EARTHWORK, prior to the commencement of the transplanting operation.

#### 3.2.2 Layout

Plant material installing sites and bed outlines shall be staked on the project site before any excavation is made. Plant material locations may be adjusted to meet field conditions.

### 3.3 INSTALLING SITE EXCAVATION

#### 3.3.1 Obstructions Below Ground

When obstructions below ground affect the work, shop drawings showing proposed adjustments to plant material location, and planting method shall be submitted for approval.

#### 3.3.2 Turf Removal and Replacement

Where the installation operation occurs in an existing lawn area, the turf shall be removed from the excavation area to a depth that will ensure the removal of the entire root system.

#### 3.3.3 Plant Pits

Plant pits shall be dug to a depth equal to the height of the root ball as measured from the base of the ball to the base of the plant trunk. Plant pits shall be dug a minimum of 3 to a maximum 5 times the diameter of the root system to allow for root expansion. The pit shall be constructed with sides sloping towards the base as a cone, to encourage well-aerated soil to

be available to the root system for favorable root growth. Cylindrical pits with vertical sides shall not be used. Pits shall be dug immediately before plants are placed in the pit.

### 3.4 INSTALLATION

#### 3.4.1 Setting Plant Material

Plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. In relation to the surrounding grade, the plant material shall be set even with the grade at which it was grown. The root system shall be spread out and arranged in its natural position. Damaged or girdled roots shall be removed with a clean cut. The beginning of the root flare shall be visible at soil level when the tree is planted, since it is critical not to plant the tree too deep. The following shall be performed:

- a. Plumb tree and backfill half of the hole.
- b. Water the hole to collapse air pockets and form a soupy mixture.
- c. Backfill and gently firm soil.
- d. Clear soil mounded against trunk.

#### 3.4.2 Root Barriers

Tree root barriers shall be installed as indicated in the contract documents and as recommended by the manufacturer. Tree root barriers shall be used for trees located up to a maximum 6 feet from paved surfaces or structures.

#### 3.4.3 Backfill Soil Mixture

The backfill soil mixture may be a mix of topsoil and soil amendments suitable for the plant material specified. When practical, the excavated soil from the plant pit that is not amended provides the best backfill and shall be used. Fertilizer shall not be used in the backfill soil mixture.

#### 3.4.4 Adding Mycorrhizal Fungi Inoculum

Mycorrhizal fungi inoculum shall be added as recommended by the manufacturer for the plant material specified.

#### 3.4.5 Backfill Procedure

Prior to backfilling, all metal, wood, synthetic products, or treated burlap devices shall be removed from the ball or root system avoiding damage to the root system. The backfill procedure shall remove air pockets from around the root system. Biodegradable burlap and tying material shall be carefully opened and folded back from the top a minimum 1/3 depth from the top of the root ball. For plant material in biodegradable containers the container shall be split prior to setting the plant with container. The plant material shall be carefully removed from containers that are not biodegradable.

##### 3.4.5.1 Earth Berm

An earth berm, consisting of backfill soil mixture, shall be formed with a minimum 4 inch height around the edge of the plant pit to aid in water retention and to provide soil for settling adjustments.

#### 3.4.6 Plant Bed

Plant material shall be set in plant beds according to the drawings. Backfill soil mixture shall be placed on previously scarified subsoil to completely surround the root balls, and shall be brought to a smooth and even surface, blending to existing areas. Earth berms shall be provided. Polymers shall be spread uniformly over the plant bed and in the planting pit as recommended by the manufacturer and thoroughly incorporated into the soil to a maximum 4 inch depth.

#### 3.4.7 Watering

A regular watering schedule shall be established. Slow deep watering shall be used. Plant pits and plant beds shall be watered immediately after backfilling, until completely saturated. Run-off and puddling shall be prevented. Watering of other plant material or adjacent areas shall be prevented.

#### 3.4.8 Staking and Guying

Staking will be required when trees are unstable or will not remain set due to their size, shape, or exposure to high wind velocity.

##### 3.4.8.1 One Bracing Stake

Trees 4 to 6 feet high shall be firmly anchored in place with one bracing stake. The bracing stake shall be placed on the side of the tree facing the prevailing wind. The bracing stake shall be driven vertically into firm ground and shall not injure the ball or root system. The tree shall be held firmly to the stake with a double strand of guying material. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. A chafing guard shall be used when metal is the guying material.

##### 3.4.8.2 Two Bracing Stakes

Trees from 6 to 8 feet height shall be firmly anchored in place with 2 bracing stakes placed on opposite sides. Bracing stakes shall be driven vertically into firm ground and shall not injure the ball or root system. The tree shall be held firmly between the stakes with a double strand of guying material. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. Chafing guards shall be used when metal is the guying material.

##### 3.4.8.3 Three Ground Stakes

Trees over a minimum 8 feet height and less than a maximum 6 inch caliper shall be held firmly in place with 3 bracing or ground stakes spaced at equal intervals around the tree. Ground stakes shall be avoided in areas to be mowed. Stakes shall be driven into firm ground outside the earth berm. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. For trees over a minimum 3 inch diameter at breast height, turnbuckles shall be used on the guying material for tree straightening purposes. One turnbuckle shall be centered on each guy line. Chafing guards shall be used when metal is the guying material.

#### 3.4.9 Deadmen or Earth Anchors

Trees over a minimum 6 inch caliper shall be held firmly in place with wood



deadmen buried a minimum 3 feet in the ground or metal earth anchors. Multi-strand cable guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. Turnbuckles shall be used on the guying material for tree straightening purposes. One turnbuckle shall be centered on each guy line. Chafing guards shall be used.

#### 3.4.10 Flags

A flag shall be securely fastened to each guy line between the tree, stake, deadmen, or earth anchor. The flag shall be visible to pedestrians.

### 3.5 FINISHING

#### 3.5.1 Plant Material

Prior to placing mulch, the installed area shall be uniformly edged to provide a clear division line between the planted area and the adjacent turf area, shaped as indicated. The installed area shall be raked and smoothed while maintaining the earth berms.

#### 3.5.2 Placing Geosynthetics

Prior to placing mulch, geosynthetics shall be placed as indicated in the construction documents and in accordance with the manufacturer's recommendations.

#### 3.5.3 Placing Mulch

The placement of mulch shall occur a maximum of 48 hours after planting. Mulch, used to reduce soil water loss, regulate soil temperature and prevent weed growth, shall be spread to cover the installed area with a minimum 4 inch uniform thickness. Mulch shall be kept out of the crowns of shrubs, ground cover, and vines and shall be kept off buildings, sidewalks and other facilities.

#### 3.5.4 Pruning

Pruning shall be accomplished by trained and experienced personnel. The pruning of trees and palms shall be in accordance with ANSI A300. Only dead or broken material shall be pruned from installed plants. The typical growth habit of individual plant material shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off".

### 3.6 MAINTENANCE DURING TRANSPLANTING OPERATION

Installed plant material shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed to prevent desiccation and shall continue until the plant establishment period commences. Installed areas shall be kept free of weeds, grass, and other undesired vegetation. The maintenance includes maintaining the mulch, watering, and adjusting settling.

### 3.7 RESTORATION AND CLEAN UP

#### 3.7.1 Restoration

Turf areas containing ruts or dead turf, as a result of work under this contract, shall be graded smooth and sodded with the same species. All pavements and facilities that have been damaged from the transplanting operation shall be restored to original condition at the Contractor's expense.

### 3.7.2 Backfill Removal Site Plant Pits

The Contractor shall ensure that all remaining holes from the removal site have been backfilled, tamped and finished to meet existing grade after settling. Turf shall be installed in accordance with Section 02920 SEEDING, SODDING, and TOPSOIL.

### 3.7.3 Clean Up

Excess and waste material shall be removed from both removal site and the installed site and shall be disposed offsite at an approved landfill or recycling center. Adjacent paved areas shall be cleared.

## 3.8 PLANT ESTABLISHMENT PERIOD

### 3.8.1 Commencement

Upon completion of the last day of the installing operation, the plant establishment period for maintaining installed plant material in a healthy growing condition shall commence and shall be in effect for the remaining contract time period, not to exceed 12 months. Written calendar time period shall be furnished for the plant establishment period. When there is more than one plant establishment period, the boundaries of the planted area covered for each period shall be described. The plant establishment period shall be coordinated with Sections 02920 SEEDING, SODDING, and TOPSOIL; 02923 SOIL BIOENGINEERING; and 02930 EXTERIOR PLANTING. The plant establishment period shall be modified for separate completion dates for areas.

### 3.8.2 Maintenance During Establishment Period

Maintenance of plant material shall include straightening plant material, straightening stakes; tightening guying material; correcting girdling; supplementing mulch; pruning dead or broken branch tips; maintaining plant material labels; watering; eradicating weeds, insects and disease; post-fertilization; and removing and replacing unhealthy plants. The plant material shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is estimated to be the equivalent of 1 inch absorbed water per week, delivered in the form of rain or augmented by watering. Run-off, puddling and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or existing plant material shall be prevented.

#### 3.8.2.1 Weeding

Grass and weeds in the installed areas shall not be allowed to reach a maximum 3 inches height before being completely removed, including the root system.

#### 3.8.2.2 Post-Fertilization

The plant material shall be top dressed at least once during the period of

establishment with controlled release fertilizer (paragraph SOIL AMENDMENTS) applied at the rate of 2 pounds per 100 square feet of plant pit or bed area. Dry fertilizer adhering to plants shall be flushed off. The application shall be timed prior to the advent of winter dormancy.

#### 3.8.2.3 Plant Pit Settling

When settling occurs to the backfill soil mixture, additional backfill soil shall be added to the plant pit or plant bed until the backfill level is equal to the surrounding grade. Serious settling that affects the setting of the plant in relation to the maximum depth at which it was grown requires replanting in accordance with paragraph INSTALLATION. The earth berm shall be maintained.

#### 3.8.2.4 Removal Site Settlement

All plant pits at the removal site shall meet existing grade after settling. Correction shall be provided as required and in accordance with paragraph BACKFILL REMOVAL SITE PLANT PITS.

#### 3.8.2.5 Maintenance Record

A record shall be furnished describing the maintenance work performed, the quantity of plant losses, diagnosis of the plant loss, and the quantity of replacements made on each site visit.

#### 3.8.3 Acceptable Plant Material

Plant material shall be undamaged, well shaped, vigorous and healthy with a well branched root system, free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement or abrasion after transplanting and in accordance with paragraph PLANT MATERIAL SURVIVABILITY. Plant material showing desiccation, abrasion, sun-scald injury or structural branching damage shall be replaced at no cost to the Government.

#### 3.8.4 Unhealthy Or Dead Plant Material

##### 3.8.4.1 Transplant Shock

Deciduous plants showing symptoms of leaf scorch, a yellowing or bronzing of the tissue between the veins or along the margins of leaves or wilting; leaf rolling or curling may be need to be replaced, if required by the Contracting Officer. Evergreen plant stress is exhibited by overall grey-green color followed by light tan. The Contractor shall evaluate the severity of the symptom and shall provide recommendations.

##### 3.8.4.2 Dead Plant Material

A tree shall be considered dead when the main leader has died back, or up to a maximum 25 percent of the crown has died. A shrub shall be considered unhealthy or dead when up to a maximum 25 percent of the plant has died. This condition shall be determined by scraping on a branch an area 1/16 inch square, maximum, to determine if there is a green cambium layer below the bark. The Contractor shall determine the cause for dead plant material and shall provide recommendations for replacement. Dead plant material shall be removed immediately and shall be replaced as soon as seasonal conditions permit.

##### 3.8.4.3 Replacement Plant Material

Replacement plant material shall be installed in accordance with paragraph INSTALLATION. Plant material shall be replaced in accordance with paragraph WARRANTY. An extended plant establishment period shall not be required for replacement plant material.

#### 3.8.5 Maintenance Instructions

Written instructions shall be furnished containing drawings and other necessary information for year-round care of the installed plant material; including, when and where maintenance should occur, and the procedures for plant material replacement.

#### 3.8.6 End of Establishment Period Clean Up

The Contractor shall remove all guying, bracing and staking at the end the establishment period with the approval of the Contracting Officer. All materials removed as a result of this operation shall be disposed offsite at an approved landfill. Any damage resulting from this operation shall be restored to its original condition at the Contractor's expense.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02920

SEEDING, SODDING, and TOPSOIL

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 SOURCE INSPECTION
- 1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING
  - 1.4.1 Inspection
  - 1.4.2 Storage
  - 1.4.3 Handling
  - 1.4.4 Soil Amendments

PART 2 PRODUCTS

- 2.1 SEED
  - 2.1.1 Seed Classification
  - 2.1.2 Permanent Seed Species and Mixtures
  - 2.1.3 Temporary Seed Species
  - 2.1.4 Quality
- 2.2 SOD
  - 2.2.1 Quality
  - 2.2.2 Harvesting
  - 2.2.3 Delivery
- 2.3 TOPSOIL
- 2.4 SOIL AMENDMENTS
  - 2.4.1 Fertilizer
  - 2.4.2 Organic Material
    - 2.4.2.1 Rotted Manure
    - 2.4.2.2 Recycled Compost
- 2.5 MULCH
  - 2.5.1 Straw Mulch
  - 2.5.2 Paper Fiber
- 2.6 WATER
- 2.7 PESTICIDE
- 2.8 HERBICIDE

PART 3 EXECUTION

- 3.1 INSTALLING SEED TIME AND CONDITIONS
  - 3.1.1 Notification
  - 3.1.2 Seeding Time
  - 3.1.3 Seeding Conditions
- 3.2 SOIL TEST
- 3.3 SITE PREPARATION
  - 3.3.1 Finished Grade and Topsoil
  - 3.3.2 Spreading Topsoil
    - 3.3.2.1 Equipment

Grand Forks Phase 2 Levees

- 3.3.2.2 Stripped Materials
- 3.3.3 Tillage
- 3.3.4 Treatments
- 3.3.5 Prepared Surface
- 3.4 SEEDING
  - 3.4.1 Equipment
  - 3.4.2 Broadcast Seeding
  - 3.4.3 Drill Seeding
  - 3.4.4 Hydroseeding (Optional)
  - 3.4.5 Mulching
    - 3.4.5.1 Hay or Straw Mulch
    - 3.4.5.2 Mechanical Anchor
    - 3.4.5.3 Wood Cellulose Fiber, Paper Fiber, and Recycled Paper
  - 3.4.6 Initial Watering
  - 3.4.7 Native Grasses
- 3.5 SODDING
  - 3.5.1 Placement
  - 3.5.2 Rolling and Watering
- 3.6 RESTORATION AND CLEAN UP
- 3.7 MAINTENANCE
  - 3.7.1 Maintenance Watering
  - 3.7.2 Mowing
  - 3.7.3 General Maintenance
    - 3.7.3.1 Repair or Reinstall
  - 3.7.4 Maintenance Record
- 3.8 ACCEPTANCE
- 3.9 SURFACE EROSION CONTROL

-- End of Section Table of Contents --

SECTION 02920

SEEDING, SODDING, and TOPSOIL

PART 1 GENERAL

Wherever possible, all seed shall be drilled. Other seeding methods are subject to approval. Existing turf areas which have been damaged during the contract operations, and which are outside of the limits designated to be seeded, shall be restored following the requirements in this section, at no additional cost to the Government.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AGRICULTURAL MARKETING SERVICE (AMS)

AMS-01 (Aug 95) Federal Seed Act Regulations Part 201

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4972 (1995a) pH of Soils

ASTM D 5268 (1992; R 1996) Topsoil Used for Landscaping Purposes

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION (NDDOT)

NDDOT SS Section 708 (1997) Standard Specifications for Road and Bridge Construction - Erosion Control

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Manufacturer's Literature; FIO

The Contractor shall submit manufacturer's literature discussing physical characteristics, applications, guarantees, and installation of the seed, mulch, and fertilizer. The Contractor shall submit manufacturer's literature for equipment showing application and installation instructions.

SD-09 Reports

Soil Test; FIO

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

Seed Test; FIO

The Contractor shall submit test reports for a purity and germination test following the Association of Official Seed Analysts (AOSA) rules for each seed mixture. The test reports shall indicate the purity percentage, germination percentage, and amount of Pure Live Seed (PLS) per bag for each species.

Water Test; FIO

Water from sources other than municipal water supply shall be tested for salinity and pH.

SD-13 Certificates

Experience for Native Grasses; FIO

The Contractor shall submit a statement indicating that the work to establish the turf will be supervised by an individual with a minimum of 5 years experience with establishment and restoration of native plant communities.

Certificates of Compliance; FIO

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

- a. Seed. Mixture percentage, percent pure live seed, percent germination, weed seed content, and date tested.
- b. Topsoil. Gradation, pH, organic matter content, textural class, soluble salts.
- d. Fertilizer. Chemical analysis and composition percent.
- e. Organic Material: Composition and source.
- f. Mulch: Composition and source.

SD-14 Samples

Samples; FIO

Samples shall be provided for the following:

- a. A 5 pound sample for each source of topsoil brought from off-site.
- b. A 2 pound sample for each type of soil amendment proposed for use.
- c. A 2 pound sample for each type of mulch proposed for use.

SD-18 Records



Quantity Check; FIO

Bag count or bulk weight measurements of material used compared with area covered to determine the application rate and quantity installed.

Maintenance Record; FIO

Maintenance work performed, area repaired or reinstalled, diagnosis for unsatisfactory stand of grass plants.

Seed Order for Native Grasses; FIO

Contractor shall submit proof of seed order for native grass seed mixes as specified within this section within 30 days of notice to proceed.

1.3 SOURCE INSPECTION

The source of delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed materials shall be delivered in manufacturer's original, unopened containers with labels and tags intact and legible. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected. Other materials shall be inspected for compliance with specified requirements. The following shall be rejected: open soil amendment containers or wet soil amendments; topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter; and topsoil that contains viable plants and plant parts. Unacceptable materials shall be removed from the job site.

1.4.2 Storage

Materials shall be stored on-site in areas provided by the Contractor. The storage areas shall be made accessible to the Contracting Officer so that application rates can be verified. Seed, lime, and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment materials shall be stored according to manufacturer's instructions and not with seed.

1.4.3 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

1.4.4 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

PART 2 PRODUCTS

2.1 SEED

Substitutions will not be allowed without written request and approval from the Contracting Officer. The mixing of seed may be done by the seed supplier prior to delivery, or on site in the presence of the Contracting Officer. Seed for native grass and forbe species shall be gathered from within 500 miles of the jobsite.

#### 2.1.1 Seed Classification

State-certified seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for mixture percentage, purity, germination, weed seed content, and inert material. Labels shall be in conformance with AMS-01 and applicable state seed laws.

#### 2.1.2 Permanent Seed Species and Mixtures

Permanent grass seed species and mixtures shall be proportioned by weight as follows:

##### GRASS SPECIES

##### Class I (Low Maintenance Turf

| COMMON NAME                   | BOTANICAL NAME     | % OF MIX     |
|-------------------------------|--------------------|--------------|
| Fescue, creeping-red "Cindy"  | Festuca rubra      | 10.0         |
| Rye-grass, perennial "Elf"    | Lolium perene      | 14.0         |
| Bluegrass, Canada             | Poa compressa      | 12.0         |
| Bluegrass, fowl               | Poa palustris      | 10.0         |
| Bluegrass, common "98/85"     | Poa pratensis      | 12.0         |
| Bluegrass, Kentucky "Park"    | Poa pratensis      | 12.0         |
| Bluegrass, Kentucky "Caliber" | Poa pratensis      | 10.0         |
| Alkali grass, "Salty"         | Puccinella distans | 19.0         |
| White clover                  | Trifolium repens   | 1.0          |
|                               |                    | Total: 100.0 |

Rate: 100 lbs/acre (110 kg/ha).

Description: Low maintenance turf mix. General purpose seed mix for park areas and dry-side of levee.

##### Class II (Upland Grasses)

| COMMON NAME            | BOTANICAL NAME          | % OF MIX     |
|------------------------|-------------------------|--------------|
| Grama, sideoats        | Bouteloua curtipendula  | 8.0          |
| Grama, blue            | Bouteloua gracilis      | 6.0          |
| Prairie clover, purple | Dalea purpureum         | 2.0          |
| Wild rye, Canada       | Elymus canadensis       | 4.0          |
| Wheat grass, slender   | Elymus trachycaulus     | 6.0          |
| Rye grass, annual      | Lolium italicum         | 8.0          |
| ReGreen                | NA                      | 26.0         |
| Blue grass, Canada     | Poa compressa           | 12.0         |
| Alkali grass           | Puccinella distans      | 16.0         |
| Bluestem, little       | Schizachyrium scoparium | 10.0         |
| Dropseed, sand         | Sporobolus cryptandrus  | 2.0          |
|                        |                         | Total: 100.0 |

Rate: 60 lbs/acre (66 kg/ha).

Description: Combination native and turf mix. General purpose seed mix for wet-side of levee except where noted in park areas.

##### Class II (Upland Grasses with forbs)

| COMMON NAME     | BOTANICAL NAME         | % OF MIX |
|-----------------|------------------------|----------|
| Grama, sideoats | Bouteloua curtipendula | 8.0      |
| Grama, blue     | Bouteloua gracilis     | 6.0      |

Grand Forks Phase 2 Levees

|                         |                         |              |
|-------------------------|-------------------------|--------------|
| Wild rye, Canada        | Elymus canadensis       | 4.0          |
| Wheat grass, slender    | Elymus trachycaulus     | 8.0          |
| Rye grass, annual       | Lolium italicum         | 8.0          |
| Forbs (see table below) | NA                      | 8.0          |
| ReGreen                 | NA                      | 26.0         |
| Blue grass, Canada      | Poa compressa           | 10.0         |
| Alkali grass            | Puccinella distans      | 10.0         |
| Bluestem, little        | Schizachyrium scoparium | 10.0         |
| Dropseed, sand          | Sporobolus cryptandrus  | 2.0          |
|                         |                         | Total: 100.0 |

Rate: 60 lbs/acre (66 kg/ha).

Description: Combination native and turf mix. General purpose seed mix for wet-side of levee except where noted in park areas.

Class II (Forbs)

| COMMON NAME               | BOTANICAL NAME          |
|---------------------------|-------------------------|
| Onion, prairie            | Allium stellatum        |
| Aster, heath              | Aster ericoides         |
| Aster, smooth-blue        | Aster laevis            |
| Milkvetch, Canada         | Astragalus canadensis   |
| Prairie clover, white     | Dalea candidum          |
| Prairie clover, purple    | Dalea purpureurn        |
| Tick-trefoil, showy       | Desmodium canadense     |
| Coneflower, narrow-leaved | Echinacea angustifolia  |
| Ox-eye, common            | Heliopsis helianthoides |
| Bushclover, round-headed  | Lespedeza cupitata      |
| Blazingstar, rough        | Liatris aspera          |
| Blazingstar, tall         | Liatris pycnostachya    |
| Bergamot, wild            | Monarda fistulosa       |
| Penstemon, showy          | Penstemon grandiflorum  |
| Coneflower, columnar      | Ratibida columnifera    |
| Black-eyed Susan          | Rudbeckia hirta         |
| Goldenrod, stiff          | Solidago rigida         |
| Vervain, blue             | Verbena hastata         |
| Vervain, hoary            | Verbena stricta         |
| Alexanders, golden        | Zizia aurea             |

Rate: As specified in the seed mix tabulation shown above.

Description: Native forbs to be added to native grass mixtures in Eastern North Dakota.

Class III (Moist Condition Grasses)

| COMMON NAME          | BOTANICAL NAME           | % OF MIX |
|----------------------|--------------------------|----------|
| Bluestein, big       | Andropogon gerardi       | 5.0      |
| Canada anemone       | Anemone canadensis       | 0.1      |
| Marsh Milkweed       | Asclepias incarnata      | 0.5      |
| New England aster    | Aster novae-angliae      | 0.6      |
| Swamp aster          | Aster puniceus           | 0.6      |
| Fringed brome        | Bromus ciliata           | 5.0      |
| Blue joint grass     | Calamagrostis canadensis | 0.1      |
| Bottlebrush sedge    | Carex comosa             | 1.0      |
| Tussock sedge        | Carex stricta            | 0.5      |
| Fox sedge            | Carex Vulpinoidea        | 0.4      |
| Showy tic-trefoil    | Desmodium canadense      | 0.4      |
| Wheat grass, slender | Elymus trachycaulus      | 6.0      |
| Virginia wild-rye    | Elymus virginicus        | 6.0      |
| Joe-pye weed         | Eupatorium maculatum     | 0.4      |
| Boneset              | Eupatorium perfoliatum   | 0.3      |
| Reed manna grass     | Glyceria grandis         | 0.3      |

Grand Forks Phase 2 Levees

|                        |                           |      |
|------------------------|---------------------------|------|
| Fowl manna grass       | Glyceria striata          | 0.2  |
| Early sunflower        | Heliopsis helianthoides   | 0.7  |
| Blue-flag iris         | Iris virginica-shrevii    | 0.5  |
| Common rush            | Juncus effusus            | 0.2  |
| Meadow blazingstar     | Liatris ligulistylis      | 0.4  |
| Tall blazingstar       | Liatris pycnostachya      | 0.4  |
| Great blue lobelia     | Lobelia siphilitica       | 0.1  |
| Rye grass, annual      | Lolium italicum           | 10.0 |
| Monkey flower          | Mimulus ringens           | 0.1  |
| Wild Bergamot          | Monarda fistulosa         | 0.6  |
| ReGreen                | NA                        | 42.0 |
| Switch grass           | Panicum virgatum          | 1.0  |
| Fowl bluegrass         | Poa palustris             | 5.0  |
| Black-eyed Susans      | Rudbeckia hirta           | 0.6  |
| Green bulrush          | Scirpus atrovirens        | 0.3  |
| Wool grass             | Scirpus cyperinus         | 0.3  |
| Soft-stem bulrush      | Scirpus vallisidus        | 1.0  |
| Grass-leaved goldenrod | Solidago graminifolia     | 0.2  |
| Indian grass           | Sorghastrum nutans        | 6.0  |
| Prairie cord grass     | Spartina pectinata        | 2.0  |
| Blue vervain           | Verbena hastata           | 0.5  |
| Ironweed               | Veronica fasciculata      | 0.2  |
| Culver's root          | Veronicastrum virginianum | 0.1  |
| Golden Alexander's     | Zizia aurea               | 0.4  |

Total: 100.0

Rate: 30 lbs/acre (33 kg/ha).

Description: Combination native sedge/prairie meadow mix. Seed mix designed for hydric soils and wetland restoration.

Class IV (Bank Stabilization Grasses and Forbs)

Shoreline Zone

| BOTANICAL NAME               | COMMON NAME          | OUNCES/<br>ACRE | PLANTS/<br>100 LF<br>or<br>4,000 SF |
|------------------------------|----------------------|-----------------|-------------------------------------|
| Andropogon gerardii          | Big Bluestem grass   | 80.00           |                                     |
| Asclepias incarnata          | Swamp milkweed       | 0.50            | 5                                   |
| Aster novae-angliae          | New England aster    | 1.00            |                                     |
| Salix discolorAster puniceus | Marsh aster          | 0.50            |                                     |
| Bidens fondosa               | Beggarsticks         | 4.00            |                                     |
| Carex scoparia               | Pointed broom sedge  | 6.00            |                                     |
| Carex hystrix                | Bottlebrush sedge    | 4.00            |                                     |
| Carex tricornis              | River Sedge          |                 | 20                                  |
| Cicuta maculata              | Water hemlock        | 0.10            |                                     |
| Desmodium canadense          | Showy tick trefoil   | 2.00            |                                     |
| Elymus canadensis            | Canada wild rye      | 16.00           |                                     |
| Epilobium glandulosum        | Northern willow herb | 0.10            |                                     |
| Glyceria striata             | Fowl manna grass     | 1.00            |                                     |
| Helenium autumnale           | Sneezeweed           | 1.00            |                                     |
| Juncus effusus               | Common spike rush    | 1.00            |                                     |
| Leersia oryzoides            | Rice cutgrass        | 2.00            |                                     |
| Lobelia siphilitica          | Great blue lobelia   | 0.20            |                                     |
| Lycopus americanus           | Water horehound      | 0.10            |                                     |
| Mimulus ringens              | Monkey flower        | 0.05            |                                     |
| Monarda fistulosa            | Wild bergamot        | 2.0             |                                     |
| Panicum virgatum             | Switch grass         | 20.00           | 20                                  |
| Rudbeckia laciniata          | Wild golden glow     | 0.25            | 5                                   |
| Scirpus fluviatilis          | River bulrush        | 1.00            | 20                                  |
| Scirpus lineatus             | Red bulrush          | 0.50            |                                     |

## Grand Forks Phase 2 Levees

|                         |                         |                 |                                     |
|-------------------------|-------------------------|-----------------|-------------------------------------|
| Scirpus validus creber  | Great bulrush           | 1.00            |                                     |
| Spartina pectinata      | Cord grass              |                 | 50                                  |
| Verbena hastata         | Blue vervain            | 2.00            |                                     |
| Echinochloa crusgalli   | Barnyard grass          | 16.00           |                                     |
| Avena sativa            | Oats                    | 640.0           |                                     |
| Phleum pratense         | Timothy                 | 6.00            |                                     |
| Upland Zone             |                         |                 |                                     |
| BOTANICAL NAME          | COMMON NAME             | OUNCES/<br>ACRE | PLANTS/<br>100 LF<br>or<br>3,000 SF |
| Andropogon gerardil     | Big bluestem grass      | 32.00           |                                     |
| Andropogon scoparius    | Little Bluestem         | 80.00           |                                     |
| Aster nova angliae      | New England aster       | 1.00            | 2                                   |
| Aster azureus           | Sky blue aster          |                 | 5                                   |
| Asclepias syriaca       | Common milkweed         | 0.50            |                                     |
| Asclepias tuberosa      | Butterfly milkweed      |                 | 15                                  |
| Aster novae-angliae     | New England aster       | 1.50            |                                     |
| Carex scoparia          | Sedge                   | 5.00            |                                     |
| Desmodium canadense     | Showy tick trefoil      | 2.00            |                                     |
| Echinacea angustifolium | Purple coneflower       |                 | 10                                  |
| Elymus canadensis       | Canada wild rye         | 80.00           |                                     |
| Heliopsis helianthoides | False sunflower         | 1.00            |                                     |
| Monarda fistulosa       | Wald bergamot           | 2.00            |                                     |
| Oenothera biennis       | Common evening primrose | 1.00            |                                     |
| Panicum virgatum        | Switch grass            | 48.00           |                                     |
| Penstemon digitalis     | Brearded foxglove       | 1.00            |                                     |
| Ratibida pinnata        | Yellow coneflower       | 4.00            |                                     |
| Rudbeckia hirta         | Black-eyed susan        | 8.00            |                                     |
| Solidago rigida         | Stiff golden rod        | 5.00            |                                     |
| Sorghastrum nutans      | Indian grass            | 24.00           |                                     |
| Vernonia fasciculata    | Ironweed                | 0.25            |                                     |
| Echinochloa crusgalli   | Barnyard grass          | 16.00           |                                     |
| Avena sativa            | Seed Oats               | 800.00          |                                     |

Rate: As shown above.

Description: Seed mix for slope stabilization. See Section 02923 SLOPE STABILIZATION for installation instructions.

### 2.1.3 Temporary Seed Species

Seed species for winter erosion protection, temporary surface erosion control, or overseeding shall consist of 10 pounds of oats per acre.

### 2.1.4 Quality

Weed seed shall be a maximum 1/2 of 1 percent by weight of the total mixture. Inoculant shall consist of the proper bacteria applied in the amount and manner recommended by the manufacturer to all legumes in the seed mix.

### 2.2 SOD

Sod shall be nursery grown as classified in the ASPA Guideline Specifications to Sodding. Sod shall be 100 percent mineral sod. Sod grown in peat soils will not be accepted. Sod shall consist of at least 75 percent Kentucky Blue Grass (*Poa pratensis*). Acceptable varieties include park, newport, glade, nugget, touch down, rugby, and parade.

### 2.2.1 Quality

Sod shall be machine cut at a uniform soil thickness of 5/8 inch, plus or minus 1/4 inch, at the time of cutting. Measurement of thickness shall exclude top growth and thatch. Standard size sections of sod shall be strong enough that when grasped at one end, can be picked up and handled without damage. Sod shall not be harvested or transplanted when moisture content, either excessively dry or wet, may adversely affect its survival. Broken pads and pads with torn or uneven ends will not be accepted. The pieces of sod shall not vary more than 1/2 inch in width.

### 2.2.2 Harvesting

Before harvesting, the turf shall be mowed uniformly at a height of 1 to 1-1/2 inches. Sod shall be harvested, delivered and transplanted within a period of 36 hours. Sod not transplanted within this time period shall not be installed without the inspection and approval of the Contracting Officer.

### 2.2.3 Delivery

Sod Pallets shall be sprinkled with water and covered with moist burlap, straw, or other approved covering and protected from exposure to wind and direct sunlight. Covering shall be such that air can circulate and heating will not develop.

## 2.3 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

## 2.4 SOIL AMENDMENTS

Soil amendments required under this contract consist of fertilizer. Soil amendments consisting of pH adjuster, organic material and soil conditioners may be added at the Contractors option if approved by the Contracting Officer, or shall be added if directed by the Contracting Officer and will be negotiated in accordance with contract clause: CHANGES.

### 2.4.1 Fertilizer

The nutrients ratio shall be 20 percent nitrogen, 20 percent phosphorus, and 20 percent potassium. Fertilizer shall be controlled release commercial grade, free flowing, and uniform in composition.

### 2.4.2 Organic Material

Organic material shall consist of either rotted manure, recycled compost, or worm castings. Bonemeal and decomposed wood derivatives shall not be used.

#### 2.4.2.1 Rotted Manure

Rotted manure shall be unleached horse, chicken or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. It shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and be free of stones,

sticks, and soil.

#### 2.4.2.2 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. Compost shall be derived from vegetable food products; agricultural or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length.

### 2.5 MULCH

#### 2.5.1 Straw Mulch

Straw mulch materials shall consist of wheat, oat, or rye straw, hay, grass, or other plants approved by the Contracting Officer. Mulch materials shall be native to the region. The mulch material shall be air dry, reasonably light in color, and shall not be musty, moldy, caked, or otherwise of low quality. The mulch shall be seed free or fumigated to prevent introduction of weeds. The use of mulch that contains noxious weeds will not be accepted. Dry mulching material which breaks and does not bend is unacceptable. Mulch shall have a consistency for placing with commercial mulch blowing equipment.

#### 2.5.2 Paper Fiber

Paper fiber mulch shall be recycled news print that is shredded for the purpose of mulching seed.

### 2.6 WATER

Water shall be the responsibility of the Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

### 2.7 PESTICIDE

Pesticide shall not be applied without written approval of the Contracting Officer.

### 2.8 HERBICIDE

Herbicide shall be broad spectrum that leaves no lasting harmful residues and allows planting within 10 to 14 days after application. The herbicide shall be glyphosate based. Herbicide shall be applied per manufacturer's recommendations.

## PART 3 EXECUTION

### 3.1 INSTALLING SEED TIME AND CONDITIONS

#### 3.1.1 Notification

The Contractor shall notify the Contracting Officer 24 hours in advance of

beginning seeding or any changes in turf establishment operations.

#### 3.1.2 Seeding Time

Seed shall be installed before June 15 and after September 1, per NDDOT SS Section 708. No finished construction area shall be left untopsoiled and unseeded during the winter months. When substantially complete areas are not seeded within the specified seeding times for fall planting, a temporary winter cover shall be placed.

#### 3.1.3 Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed alternate times shall be submitted for approval.

### 3.2 SOIL TEST

Delivered topsoil, existing soil in smooth graded areas, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, and organic matter content. The samples shall be taken at locations directed by the Contracting Officer, unless waived. The tests shall determine the quantities and type of soil amendments required to meet local growing conditions for the seed species specified.

### 3.3 SITE PREPARATION

#### 3.3.1 Finished Grade and Topsoil

The Contractor shall verify that finished grades are as indicated on drawings, and the placing of topsoil, smooth grading, and compaction requirements have been completed prior to the commencement of the seeding operation. All vegetation, including live roots, shall be completely removed or treated with herbicide prior to spreading topsoil or placing sod.

#### 3.3.2 Spreading Topsoil

Topsoil shall be distributed and spread uniformly to one half the thickness shown on the plans and tilled to a depth of 2 inches into the subgrade. The remaining half of the topsoil shall then be placed. Surface irregularities resulting from topsoiling or other operations shall be leveled to prevent depressions.

##### 3.3.2.1 Equipment

Topsoil shall be spread using a bladed dozer having ground pressure less than 4.5 psi and operating weight less than 35,000 pounds, or with rubber tired equipment having operating weight less than 10,000 pounds. The work shall be coordinated such that equipment for hauling the topsoil does not travel over the topsoil in place. Areas compacted by construction operations shall be completely pulverized by tillage.

##### 3.3.2.2 Stripped Materials.

Topsoil obtained from stripping operations shall be kept separate from other unusable excavated materials, brush, litter, objectionable weeds,



roots, stones, and other materials that would interfere with planting and maintenance operations. Unusable material shall be removed and properly disposed of.

### 3.3.3 Tillage

Topsoil on slopes up to a maximum 3H:1V slope shall be tilled to a nominal 3 inch depth by plowing, disking, harrowing, rototilling or other approved method. On slopes between 3H:1V and 1:1, the soil shall be tilled to a minimum 2 inch depth by scarifying with heavy rakes, or other method.

### 3.3.4 Treatments

Fertilizers shall be applied per manufacturer's directions. The fertilizer shall be applied at the rate recommended by the soil test. Fertilizer may be incorporated as part of the tillage operation. The Contractor shall assume full responsibility for any loss or damage to seed or sod arising from improper use of herbicides or other chemicals or due to failure to allow sufficient time to permit dissipation of toxic residues, whether or not such materials are specified herein.

### 3.3.5 Prepared Surface

The prepared surface shall be 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove debris. Debris and stones over a minimum 1-1/2 inches in any dimension shall be removed from the surface. Drainage patterns shall be maintained as indicated on drawings. Tolerance for prepared surfaces shall be within 1 inch of the plan elevation. The prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion.

## 3.4 SEEDING

Prior to installing seed, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

### 3.4.1 Equipment

Gravity feed applicators, which drop seed directly from a hopper onto the prepared soil, shall not be used because of the difficulty in achieving even coverage, unless otherwise approved.

### 3.4.2 Broadcast Seeding

In areas inaccessible to drill seeding, seed shall be broadcast by hand. Seed shall be uniformly broadcast at the rate specified for the mix. Half the total rate of seed application shall be sown with sower moving in one direction, and the remainder with sower moving at right angles to first sowing. Seed shall be covered a maximum 1/4 inch depth by disk harrow, steel mat drag, cultipacker, or other approved device. Seed shall not be broadcast when wind speed exceeds 5 miles per hour.

### 3.4.3 Drill Seeding

Seed shall be uniformly drilled to a depth of 1/2 to 3/4 inches at the rate specified for the mix. Equipment shall have drills a maximum 6 inches

distance apart. Row markers shall be used with the drill seeder. Seed shall be drilled in two directions, applying approximately half the seed in each direction. The drilling equipment shall be maintained with half full seed boxes during the seeding operations. When slopes exceed 1 vertical on 5 horizontal, baffle plates spaced not more than 6 inches apart shall be installed in the seed box.

#### 3.4.4 Hydroseeding (Optional)

The hydroseeding operation shall apply the seed, mulch, and fertilizer simultaneously. The seed shall be applied at the rate indicated in the Seed Mixture Table. The fertilizer shall be applied at a rate proposed by the Contractor and agreed to by the Contracting Officer. The mulch shall be applied at a rate of about 1 ton per acre. During application, the spray shall be directed to obtain a uniform material distribution as evidenced by a formation of a "blotter-like" cover, with about 5% void area. The mulch shall permit percolation of water to the underlying soil. The seed mixed with water and fertilizer shall be applied within 1 hour after adding to the tank.

#### 3.4.5 Mulching

##### 3.4.5.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly at the rate of 2 tons per acre, except as modified for native grasses. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.

##### 3.4.5.2 Mechanical Anchor

Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment.

##### 3.4.5.3 Wood Cellulose Fiber, Paper Fiber, and Recycled Paper

Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. The mulch shall be mixed and applied in accordance with the manufacturer's recommendations.

#### 3.4.6 Initial Watering

Watering shall be started immediately after completing the seeding of an area. Water shall be applied to supplement rainfall at a rate sufficient to ensure moist soil conditions to a minimum 3 inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed by Contracting Officer.

#### 3.4.7 Native Grasses

Hay or straw mulch shall be spread uniformly at the rate of 2 tons per acre. Areas seeded with native grasses, except slopes steeper than 3H:1V, shall be firmed with a roller not exceeding 90 pounds per foot roller

width. Seed drills equipped with rollers are acceptable.

### 3.5 SODDING

#### 3.5.1 Placement

Sod shall be carefully placed with the first row laid in a straight line and subsequent rows placed parallel to and abutted tightly against each other. Sod shall be placed with staggered end joints and without stretching or overlapping. On slope areas sodding shall be started at the bottom of the slope. On 1:3 or steeper slopes, sod shall be laid across the angle of the slope and secured by tamping, pegging or other approved methods of temporarily securing each piece. In areas where concentrated flow of water is expected, sod shall be laid at right angles to the flow. After the sodding operation has been completed, the edges of the sodded area shall blend smoothly into the surrounding area.

#### 3.5.2 Rolling and Watering

After completion of the sod placement in each area, the Contractor shall water the sod immediately, and the entire area shall be lightly rolled. The sod shall be watered to a depth sufficient such that the underside of the sod pad and the soil immediately below the pad are thoroughly wet. Watering operations shall be properly supervised to prevent run-off. The Contractor shall arrange for an adequate water supply and all equipment necessary for water application shall be supplied including all pumps, hoses, pipelines, and sprinkling equipment until final acceptance is made.

### 3.6 RESTORATION AND CLEAN UP

Immediately upon completion of the seeding operation in an area, the area shall be protected against traffic or other use by erecting barricades, providing signage, or as directed by Contracting Officer. Existing turf areas, pavements, riprap areas and other project features that have been damaged from the seeding operation shall be restored to original condition at Contractor's expense. Excess and waste material shall be removed from the seeded areas and shall be disposed offsite. Adjacent paved areas shall be cleaned.

### 3.7 MAINTENANCE

#### 3.7.1 Maintenance Watering

The Contractor shall be responsible for watering after planting to promote adequate growth and development. Water shall be distributed with equipment that does not erode or disturb the mulch. If the grass wilts, or if the soil becomes crusted and desiccated during germination, the Contracting Officer may direct watering. Watering directed by the Contracting Officer shall be performed within 48 hours after notice by the Contracting Officer to the Contractor; and shall place about 10,000 gallons per acre.

#### 3.7.2 Mowing

- a. Bluegrass predominant seed mixes: Mowing shall be done as needed to maintain lawn areas at a nominal height of 3 inches until final acceptance, except not more than 1/3 of the grass leaf shall be removed by the initial cutting. Clippings shall be removed when the amount of cut turf is heavy enough to damage the turfed areas. Seeded areas shall be mowed immediately prior to final inspection.

- b. Native Grasses: Areas seeded with native grasses shall be mowed during the first growing season to control pioneering weeds and other competition. For the purposes of this project a weed is defined as any plant not included in the seed mix. Mowing should be done before the general height is 6 to 10 inches, or when the weedy foliar cover reaches 50 percent of the seeded area, or when the weed species begin to flower. The first mowing shall be set at a height of 3 inches with the following mowings to be set at a height of 4 to 8 inches. Rotary, flail, or sickle bar type mowing equipment is acceptable.

### 3.7.3 General Maintenance

Maintenance of the seeded areas shall include eradicating weeds, protecting embankments and ditches from surface erosion, maintaining erosion control materials and mulch, protecting installed areas from traffic, mowing, watering, and post-fertilization. If any portion of the surface becomes rilled, gullied, damaged, or destroyed, that portion shall be repaired to re-establish the area without additional cost to the government. The Contractor shall control erosion during the maintenance period by using ditch checks, sod swales, silt fences or other methods until a proper stand of turf is established.

#### 3.7.3.1 Repair or Reinstall

Unsatisfactory stand of grass plants and mulch shall be repaired or reinstalled, and eroded areas shall be properly filled. Mulch material that has been removed by wind or other causes shall be replaced and secured. Maintenance shall include protecting embankments and ditches from erosion and maintaining erosion control material.

### 3.7.4 Maintenance Record

A record of each site visit shall be furnished, describing the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

## 3.8 ACCEPTANCE

Turf establishment after seeding shall extend for 12 months after completion of the seeding on the entire project, unless desired growth is established, and shortening the period of the Contractor's responsibility for acceptably established areas is authorized by the Contracting Officer. Grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch high.

- a. Bluegrass predominant seed mixes. A stand of turf is defined as a uniform stand of grass that is at least 2 inches tall with a minimum of 100 grass plants per square foot and reasonably free of weeds and visual imperfections as assessed by the Contracting Officer.
- b. Native Grasses. A proper stand of turf from the seeding of native grasses is defined as a minimum of 2 to 4 plants per square foot and where no gaps larger than 6 inches in diameter occur anywhere in the turfed area. Only plants specified in the seed mix table will be considered.

3.9 SURFACE EROSION CONTROL

Where directed, surface erosion control material shall be installed in accordance with manufacturer's instructions. Placement of the material shall be accomplished without damage to installed material and deviation to finished grade. When directed by Contracting Officer and during contract delays affecting the seeding operation or when a quick cover is required to prevent surface erosion, the areas designated shall be seeded with a temporary seed crop.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02923

SLOPE STABILIZATION

PART 1 GENERAL

- 1.1 QUALITY ASSURANCE
  - 1.1.1 Qualifications of Workmen
  - 1.1.2 Standards
- 1.2 SUBMITTALS

PART 2 PRODUCTS

- 2.1 MATERIALS
- 2.2 Erosion Control Blankets Type VIII

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Levee Installation
  - 3.1.2 Storm Water Pond Installation
- 3.2 CLEAN-UP, REMOVAL AND REPAIR
  - 3.2.1 Clean Up
  - 3.2.2 Removal
  - 3.2.3 Repair
- 3.3 INSPECTION
- 3.4 ACCEPTANCE AND GUARANTEE
  - 3.4.1 Provisional Acceptance
  - 3.4.2 Final Acceptance
  - 3.4.3 Guarantee

-- End of Section Table of Contents --

SECTION 02923

SLOPE STABILIZATION

PART 1 GENERAL

1.1 QUALITY ASSURANCE

1.1.1 Qualifications of Workmen

provide at least one person who shall be present at all times during execution of this portion of the work, who shall be thoroughly familiar with the type and operation of equipment being used. Said person shall direct all work performed under this section.

1.1.2 Standards

All materials used during this portion of the work shall meet or exceed applicable federal, state, county and local laws and regulations. All plant materials shall be free from insects and disease. Species shall be true to their scientific name as specified.

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Materials; GA.

Prior to delivery of any materials to the site, submit to the Contracting Officer a complete list of all plant materials to be used during this portion of the work. Include complete data on source, quantity and quality. This submittal shall in no way be construed as permitting substitution for specific items described on the plans or in these specifications unless approved in writing by the Contracting Officer.

Equipment; FIO.

Prior to commencement of any work, submit to the Contracting Officer a written description of all mechanical equipment and its intended use during the execution of the work.

Erosion Control Blankets; GA.

Manufacturer's literature including physical characteristics, application and installation instructions.

SD-18 Records

As-Built Plans; FIO.

After the work is complete submit to the Contracting Officer "as-built" plans including a listing of all species installed, and quantities installed. Mark in red ink on the original planting plan any field changes or deviations from the original plans.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Seeds shall be from within a 200 mile radius of the project site. See Section 02920 SEEDING, SODDING, and TOPSOIL for seed mix.

### 2.2 Erosion Control Blankets Type VIII

Erosion control blanket shall be a machine-produced 100 percent biodegradable mat with a 70 percent herbaceous straw and 30 percent coconut fiber blend matrix. The blanket shall be of consistent thickness with the straw and coconut fiber evenly distributed over the entire area of the mat.

The blanket shall be covered on the top and bottom sides with 100 percent biodegradable woven natural organic fiber netting. The netting shall consist of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine strands (commonly referred to as a Leno weave) to form an approximate 1/2 by 1/2 inch mesh. The blanket shall be sewn together with biodegradable thread on 1.5 inch centers. Straw/Coconut fiber erosion control blanket shall have the following properties:

#### Material Content

|         |  |
|---------|--|
| Matrix  | 70 percent straw fiber with approximately .35 lb/yd <sup>2</sup> weight. 30 percent coconut fiber cured in fresh water with approximately .15 lb/yd <sup>2</sup> weight. |
| Netting | Both sides woven 100% biodegradable natural organic fiber with approximately 9.3 lbs/1,000 ft <sup>2</sup> weight.   |
| Thread  | Biodegradable  |

NOTE: Photodegradable life a minimum of 24 months with a minimum 90 percent light penetration. Apply to slopes up to a maximum 1.5:1 gradient.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Levee Installation

Clear and Grub shoreline to remove existing vegetation, except that flagged by the Government. Scarify grade with toothed bucket or other implement. Apply Enkamat (7020) or approved equal per manufacturer's recommendation and cover bottom 5 feet with 12-18 inch limestone rip-rap. Spread topsoil in an even layer. Install seed per specification and above list. Apply Bonterra S-2 or approved equal per manufacturer's recommendation. Install



live plugs per above list.

### 3.1.2 Storm Water Pond Installation

The Contractor shall verify that finished grades are as indicated on the drawings; finish grading and compaction shall be completed in accordance with Section 02300 EARTHWORK, prior to the commencement of the work. The location of underground utilities and facilities in the area of the work shall be verified and marked. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

Spread topsoil in an even layer as indicated on drawings. Place seed in accordance with Section 02920 SEEDING, SODDING, and TOPSOIL, using the seeding mix presented and shown on the drawings. Prior to planting the emergent zone live plants, draw down any water 2 days prior to planting. Place erosion control blanket in accordance with manufacturer's recommendations. Place mulch in accordance with Section 02920 SEEDING, SODDING, and TOPSOIL.

### 3.2 CLEAN-UP, REMOVAL AND REPAIR

#### 3.2.1 Clean Up

The Contractor shall keep the work area free of debris. After the work is complete, clean up any remaining materials, debris, trash, etc. Avoid driving or walking over bank stabilization areas to minimize disturbance.

#### 3.2.2 Removal

After work has been completed remove any tools, equipment, empty containers, and all other debris generated by the Contractor.

#### 3.2.3 Repair

Repair any damages caused by the Contractor during completion of the work described in this Section.

### 3.3 INSPECTION

After completion of the work, the Contractor shall schedule with the Government a provisional acceptance inspection of the work.

### 3.4 ACCEPTANCE AND GUARANTEE

#### 3.4.1 Provisional Acceptance

The work shall be considered 90 percent complete after initial installation of seeding and plugs, and after the Contractor has completed all required clean up, removal, and repair as described in paragraph CLEAN-UP, REMOVAL AND REPAIR.

#### 3.4.2 Final Acceptance

The work shall be considered 100 percent complete after the Contractor has met or exceeded the performance standards specified in paragraph GUARANTEE, and has completed all required clean up, removal, and repair as described in paragraph CLEAN-UP, REMOVAL AND REPAIR.

#### 3.4.3 Guarantee

The Contractor shall guarantee bank stabilization work will meet or exceed the following performance criteria one full growing season after provisional acceptance: 50 percent survivorship of all plugs and seeded areas provide 100 percent cover.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02930

EXTERIOR PLANTING

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, STORAGE, AND HANDLING
  - 1.3.1 Delivery
    - 1.3.1.1 Plant Material Identification
    - 1.3.1.2 Protection During Delivery
    - 1.3.1.3 Conditioners and Amendments
    - 1.3.1.4 Pesticide Material
  - 1.3.2 Storage
  - 1.3.3 Handling
- 1.4 SCHEDULE
- 1.5 INSPECTION

PART 2 PRODUCTS

- 2.1 PLANT MATERIAL
  - 2.1.1 Quality
  - 2.1.2 Method of Shipment to Maintain Health of Root System
    - 2.1.2.1 Balled and Burlapped (BB) Plant Material
    - 2.1.2.2 Bare-Root (BR) Plant Material
    - 2.1.2.3 Container-Grown (C) Plant Material
  - 2.1.3 Growth of Trunk and Crown
    - 2.1.3.1 Deciduous Trees
    - 2.1.3.2 Deciduous Shrubs
    - 2.1.3.3 Coniferous Evergreen Plant Material
    - 2.1.3.4 Ground Cover and Vine Plant Material
- 2.2 TOPSOIL
- 2.3 MULCH
- 2.4 WEED BARRIERS
- 2.5 TREE ROOT BARRIERS
- 2.6 MYCORRHIZAL FUNGI INOCULUM
- 2.7 PESTICIDE
- 2.8 TRUNK WRAPPING MATERIAL

PART 3 EXECUTION

- 3.1 PROTECTION OF EXISTING VEGETATION
- 3.2 PERCOLATION TEST
- 3.3 SITE PREPARATION
  - 3.3.1 Layout
- 3.4 INSTALLATION
  - 3.4.1 Setting Plant Material
  - 3.4.2 Backfill Soil Mixture
  - 3.4.3 Backfill Procedure

Grand Forks Phase 2 Levees

- 3.4.3.1 Bare-Root Plant Material
- 3.4.4 Staking and Guying
- 3.5 FINISHING
  - 3.5.1 Placing Mulch
  - 3.5.2 Pruning
  - 3.5.3 Wrapping
- 3.6 MAINTENANCE DURING PLANTING OPERATION
- 3.7 APPLICATION OF PESTICIDE
- 3.8 RESTORATION AND CLEAN UP
- 3.9 MAINTENANCE

-- End of Section Table of Contents --

SECTION 02930

EXTERIOR PLANTING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)

ANLA ANSI/ANLA Z60.1 (1996) American Standard for Nursery Stock

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A300 (1995) Tree Care Operations - Trees, Shrubs and other Woody Plant Maintenance

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 5268 (1992; R 1996) Topsoil Used for Landscaping Purposes

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Schedules

Plant Installation Schedule; GA

Plant installation schedule shall be submitted a minimum of 30 days before beginning plant installation. Schedule shall specify planting season (spring or fall), dates, locations, and plant materials to be installed.

SD-08 Statements

Plant Establishment Period; FIO

Upon completion of the last day of the planting operation, the plant establishment period for maintaining installed plant material in a healthy growing condition shall commence and shall be in effect for the remaining contract time period, not to exceed 12 months. Written calendar time period shall be furnished for the plant establishment period. When there is more than one plant establishment period, the boundaries of the planted area covered for each period shall be described.

SD-09 Reports

Percolation Test; FIO

Test reports, prepared by an independent testing agency.

SD-18 Records

Maintenance Record; FIO

A record shall be furnished describing the maintenance work performed, the quantity of plant losses, diagnosis of the plant loss, the quantity and date of replacements made, and pesticide application.

### 1.3 DELIVERY, STORAGE, AND HANDLING

#### 1.3.1 Delivery

##### 1.3.1.1 Plant Material Identification

Plant material shall be identified with attached, durable, waterproof labels and weather-resistant ink, stating the common name, correct botanical plant name and size.

##### 1.3.1.2 Protection During Delivery

Plant material shall be protected during delivery to prevent desiccation and damage to the branches, trunk, root system, or earth ball. Branches shall be protected by tying-in. Exposed branches shall be covered during transport.

##### 1.3.1.3 Conditioners and Amendments

Soil conditioners and amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis and name. In lieu of containers, soil conditioners and amendments may be furnished in bulk and a certificate from the manufacturer indicating the above information shall accompany each delivery.

##### 1.3.1.4 Pesticide Material

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration number and the manufacturer's registered uses.

#### 1.3.2 Storage

Plants stored on the work site shall be protected from any drying at all times by covering the balls or roots with moist sawdust, wood chips, shredded bark, peat moss, or other similar mulching material. Plants, including those in containers, shall be kept in a moist condition by watering with a fine mist spray until planted.

Storage of other material shall be in designated areas. Soil amendments shall be stored in dry locations and away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with plants or other materials.

#### 1.3.3 Handling

Plant material shall not be injured in handling. Cracking or breaking the earth ball of balled and burlapped plant material shall be avoided. Plant material shall not be handled by the trunk or stems. Materials shall not be dropped from vehicles.

#### 1.4 SCHEDULE

Planting shall be scheduled within the dates in the Optimal Planting Date table shown on the drawings. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted for approval. Planting operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped when directed.

#### 1.5 INSPECTION

Plants shall be subject to inspection at any time prior to planting. Plants may be inspected at the nursery prior to shipment, but such inspection shall not be considered as acceptance. Upon request of the Contracting Officer, the contractor shall accompany the government inspector to the nursery and identify plant material to be furnished. Unacceptable material shall be promptly removed from the job site.

### PART 2 PRODUCTS

#### 2.1 PLANT MATERIAL

Trees shall be delivered to the jobsite without wrapping (bark shall be visible for inspection).

##### 2.1.1 Quality

Well shaped, well grown, vigorous plant material having healthy and well branched root systems in accordance with ANLA ANSI/ANLA Z60.1 shall be provided. Plant material shall be provided free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plant material shall be free of shock or damage to branches, trunk, or root systems, which may occur from the digging and preparation for shipment. Plant material shall be well shaped, vigorous and healthy with a healthy, well branched root system. Plant material shall be checked for unauthorized substitution and to establish nursery grown status. The plant material shall exhibit typical form of branch to height ratio; and meet the caliper and height measurements specified. Plant material that measures less than specified, or has been poled, topped off or headed back, shall be rejected. Container-grown plant material shall show new fibrous roots and the root mass shall contain its shape when removed from the container.

##### 2.1.2 Method of Shipment to Maintain Health of Root System

###### 2.1.2.1 Balled and Burlapped (BB) Plant Material

Ball size and ratio shall be in accordance with ANLA ANSI/ANLA Z60.1. The ball shall be of a diameter and depth to encompass enough fibrous and feeding root system necessary for the full recovery of the plant. The plant stem or trunk shall be centered in the ball. All roots shall be clean cut at the ball surface. Roots shall not be pulled from the ground. Before shipment the root ball shall be dipped in gels containing

mycorrhizal fungi inoculum. The root ball shall be completely wrapped with burlap or other suitable material and securely laced with biodegradable twine. Plant material with broken or cracked balls; or broken containers shall be rejected.

#### 2.1.2.2 Bare-Root (BR) Plant Material

Minimum root spread shall be in accordance with ANLA ANSI/ANLA Z60.1. A well branched root system characteristic of the species specified shall be provided. Roots shall not be pulled from the ground. Bare-root plant material shall be inoculated with mycorrhizal fungi during germination in the nursery. Before shipment the root system shall be dipped in gels containing mycorrhizal fungi inoculum. Bare-root plant material shall be dormant. The root system shall be protected from drying out.

#### 2.1.2.3 Container-Grown (C) Plant Material

Container size shall be in accordance with ANLA ANSI/ANLA Z60.1. Plant material shall be grown in a container over a duration of time for new fibrous roots to have developed and for the root mass to retain its shape and hold together when removed from the container. Container-grown plant material shall be inoculated with mycorrhizal fungi during germination in the nursery. Before shipment the root system shall be dipped in gels containing mycorrhizal fungi inoculum. The container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.

#### 2.1.3 Growth of Trunk and Crown

##### 2.1.3.1 Deciduous Trees

A height to caliper relationship shall be provided in accordance with ANLA ANSI/ANLA Z60.1. Height of branching shall bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

- a. Single stem: The trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.
- b. Multi-stem: All countable stems, in aggregate, shall average the size specified. To be considered a stem, there shall be no division of the trunk which branches more than 6 inches from ground level.
- c. Specimen: The tree provided shall be well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be as indicated.

##### 2.1.3.2 Deciduous Shrubs

Deciduous shrubs shall have the height and number of primary stems recommended by ANLA ANSI/ANLA Z60.1. Acceptable plant material shall be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

##### 2.1.3.3 Coniferous Evergreen Plant Material

Coniferous Evergreen plant material shall have the height-to-spread ratio recommended by ANLA ANSI/ANLA Z60.1. The coniferous evergreen trees shall



not be "poled". The leader shall be whole and unpruned, including the tip.

#### 2.1.3.4 Ground Cover and Vine Plant Material

Ground cover and vine plant material shall have the minimum number of runners and length of runner recommended by ANLA ANSI/ANLA Z60.1. Plant material shall have heavy, well developed and balanced crown with vigorous, well developed root system and shall be furnished in containers.

#### 2.2 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300 EARTHWORK. Additional topsoil required beyond that available from stripping operations shall be imported. Topsoil for planting trees and shrubs shall be imported from an off site source. Topsoil shall meet the physical requirements of, and shall be tested, amended, fertilized and treated in accordance with Section 02920 SEEDING, SODDING, AND TOPSOIL.

#### 2.3 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Rotted manure and recycled mulch including compost, plastics, or pine needles is not acceptable. Wood chips and shredded or ground bark shall be treated to retard the growth of mold and fungi.

#### 2.4 WEED BARRIERS

Weed barrier shall be an inert membrane specifically manufactured and marketed for landscaping. Weed barrier shall consist of a heat bonded non-woven geotextile composed of fiberglass, polyester, or polypropylene fibers. Polymers shall be stabilized for ultraviolet light degradation

#### 2.5 TREE ROOT BARRIERS

Tree root barriers shall be metal or plastic consisting of recycled content. Barriers shall utilize vertical stabilizing members to encourage downward tree root growth. Barriers shall limit, by a minimum 90 percent, the occurrence of surface roots. Tree root barriers which are designed to be used as plant pit liners will be rejected.

#### 2.6 MYCORRHIZAL FUNGI INOCULUM

Mycorrhizal fungi inoculum shall be composed of multiple-fungus inoculum as recommended by the manufacturer for the plant material specified.

#### 2.7 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification, soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

#### 2.8 TRUNK WRAPPING MATERIAL

Tree wrap shall be two thicknesses of crinkled paper cemented together with a layer of bituminous material. Wrapping material shall be a minimum of 4 inches in width and shall stretch 33 percent without breakage. Waterproof

tape shall be used to bind wrapping to tree.

### PART 3 EXECUTION

#### 3.1 PROTECTION OF EXISTING VEGETATION

If turf areas have been established prior to planting operations, the surrounding turf shall be covered before excavations are made in a manner that will protect turf areas. Existing trees, shrubbery, and beds that are to be preserved shall be protected in accordance with the approved Environmental Protection Plan and SECTION 01000 GENERAL.

#### 3.2 PERCOLATION TEST

Test for percolation shall be done to determine positive drainage of plant pits and beds. A positive percolation shall consist of a minimum 1 inch per 3 hours. If a negative percolation test occurs, no planting shall be continued in the area represented by the test until changes are directed by the Contracting Officer.

#### 3.3 SITE PREPARATION

The Contractor shall verify that finished grades are as indicated on drawings, and that the placing of topsoil, the smooth grading, and the compaction requirements have been completed in accordance with Section 02300 EARTHWORK, prior to the commencement of the planting operation. The location of underground utilities and facilities in the area of the planting operation shall be verified. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

##### 3.3.1 Layout

Tree locations and bed outlines shall be staked by the Contractor on the project site and approved by the Contracting Officer before any plant pits or beds are dug.

#### 3.4 INSTALLATION

##### 3.4.1 Setting Plant Material

Plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. Balled and burlapped and container grown plants shall be handled and moved only by the ball or container. Plastic wrap and metal baskets shall be completely removed before the placement of backfill. Container grown stock shall be removed from containers without damaging plant or root systems. After centering the plant in pit, all ropes secured to the trunk shall be removed and burlap opened on the top 1/3 of the root ball.

##### 3.4.2 Backfill Soil Mixture

The backfill soil mixture may be a mix of topsoil and soil amendments suitable for the plant material specified. When practical, the excavated soil from the plant pit that is not amended provides the best backfill and shall be used. Mycorrhizal fungi inoculum shall be added as recommended by the manufacturer for the plant material specified.

##### 3.4.3 Backfill Procedure

Prior to backfilling, all metal, wood, synthetic products, or treated burlap devices shall be removed from the ball or root system avoiding damage to the root system. The backfill procedure shall remove air pockets from around the root system. Plant pits and plant beds shall be watered immediately after backfilling, until completely saturated.

#### 3.4.3.1 Bare-Root Plant Material

The root system shall be spread out and arranged in its natural position. Damaged roots shall be removed with a clean cut. The backfill soil mixture shall be carefully worked in amongst the roots and watered to form a soupy mixture. Air pockets shall be removed from around the root system, and root to soil contact shall be provided.

#### 3.4.4 Staking and Guying

Staking will be required when trees are unstable or will not remain set due to their size, shape, or exposure to high wind velocity. Trees that are staked and guyed shall be completed as shown.

### 3.5 FINISHING

#### 3.5.1 Placing Mulch

Care shall be taken to avoid contaminating the mulch with the planting soil. Mulch shall be kept out of the crowns of shrubs, and shall be kept off buildings, sidewalks, fences, and other facilities.

#### 3.5.2 Pruning

New plant material shall be pruned in accordance with recommended dates for each species in the following manner: prune dead and broken branches, cross branches, weak branches, and for shape. Typical growth habit of individual plants shall be retained with as much height and spread as is practicable. The pruning of trees shall be in accordance with ANSI A300. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off". Trimmings shall be disposed of as specified for clearing and grubbing debris in Section 01000 GENERAL.

#### 3.5.3 Wrapping

The trunks of deciduous trees, planted during the fall, shall be wrapped within 24 hours after planting. Trees planted during the spring shall not be wrapped until October of the year when planted. Wrap shall be removed in the following spring. The wrapping shall be securely tied at the top and bottom and at 18-inch maximum intervals with waterproof tape.

### 3.6 MAINTENANCE DURING PLANTING OPERATION

Installed plant material shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed to prevent desiccation and shall continue until the plant establishment period commences. Installed areas shall be kept free of weeds, grass, and other undesired vegetation. The maintenance includes maintaining the mulch, watering, and adjusting settling.

### 3.7 APPLICATION OF PESTICIDE

Herbicides, insecticides, and fungicides shall be applied as needed and in accordance with approved written manufacturer's recommendations. When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted. A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. The pesticide shall be prevented from coming into contact with the applicator or other persons.

### 3.8 RESTORATION AND CLEAN UP

Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the Contractor's expense. Excess and waste material shall be removed from the installed area and shall be disposed offsite. Adjacent paved areas shall be cleared.

### 3.9 MAINTENANCE

Maintenance of plant material shall include straightening plant material, straightening stakes; tightening guying material; correcting girdling; supplementing mulch; pruning dead or broken branch tips; maintaining plant material labels; watering; eradicating weeds, insects and disease; post-fertilization; and removing and replacing unhealthy plants.

a. Watering Plant Material. The plant material shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone. All watering shall be done in a manner which will provide uniform coverage but which will not cause erosion or damage to the finished surface. Water shall not be applied with a force sufficient to displace mulch and shall not be applied at such a rate that it cannot be absorbed by the mulch and plants.

b. Weeding. Grass and weeds in the installed areas shall not be allowed to reach a maximum 3 inches height before being completely removed, including the root system.

c. Post-Fertilization. The plant material shall be topdressed at least once during the period of establishment with controlled release fertilizer. Apply at the rate of 2 pounds per 100 square feet of plant pit or bed area. Dry fertilizer adhering to plants shall be flushed off. The application shall be timed prior to the advent of winter dormancy. Fertilizer in packet or tablet form shall be placed prior to backfilling and in accordance with the approved manufacturer's written recommendations.

d. Unhealthy Plant Material. A tree shall be considered unhealthy or dead when the main leader has died back, or up to a maximum 25 percent of the crown has died. A shrub shall be considered unhealthy or dead when up to a maximum 25 percent of the plant has died. This condition shall be determined by scraping on a branch an area 1/16 inch square, maximum, to determine if there is a green cambium layer below the bark. The Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be removed immediately and shall be replaced as soon as seasonal conditions permit.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE WORK

SECTION 02935

EXTERIOR PLANT MATERIAL MAINTENANCE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, INSPECTION, STORAGE, AND HANDLING
  - 1.3.1 Delivery Schedule
  - 1.3.2 Delivery of Pesticides
  - 1.3.3 Storage
  - 1.3.4 Handling

PART 2 PRODUCTS

- 2.1 SOIL AMENDMENTS
  - 2.1.1 pH Adjuster
    - 2.1.1.1 Limestone
    - 2.1.1.2 Hydrated Lime
    - 2.1.1.3 Burnt Lime
  - 2.1.2 Fertilizer
  - 2.1.3 Nitrogen Carrier Fertilizer
  - 2.1.4 Organic Material
    - 2.1.4.1 Bonemeal
    - 2.1.4.2 Rotted Manure
    - 2.1.4.3 Decomposed Wood Derivatives
    - 2.1.4.4 Recycled Compost
    - 2.1.4.5 Worm Castings
  - 2.1.5 Soil Conditioner
    - 2.1.5.1 Sand
    - 2.1.5.2 Calcined Clay
    - 2.1.5.3 Gypsum
    - 2.1.5.4 Expanded Shale, Clay, or Slate (ESCS)
- 2.2 MULCH
  - 2.2.1 Organic Mulch
    - 2.2.1.1 Shredded Bark
- 2.3 WATER
- 2.4 PESTICIDE
- 2.5 HERBICIDE

PART 3 EXECUTION

- 3.1 SOIL TESTS
- 3.2 MULCHING
- 3.3 WATERING
- 3.4 APPLICATION OF PESTICIDE
  - 3.4.1 Technical Representative
  - 3.4.2 Application
- 3.5 GENERAL MAINTENANCE REQUIREMENTS

## Grand Forks Phase 2 Levees

- 3.5.1 Pesticide Treatment
- 3.5.2 Maintenance Record
- 3.6 GRASS PLANT QUALITY
  - 3.6.1 Lawn Area
  - 3.6.2 Field Area
- 3.7 LAWN AND FIELD AREAS MAINTENANCE
  - 3.7.1 Mowing
    - 3.7.1.1 Lawn Areas
    - 3.7.1.2 Field Areas
  - 3.7.2 Turf Trimming
  - 3.7.3 Aeration
  - 3.7.4 Lime
  - 3.7.5 Herbicide Weed Control
  - 3.7.6 Turf Fertilization Program
- 3.8 PLANTING BEDS MAINTENANCE
  - 3.8.1 Trimming
  - 3.8.2 Weed Control
- 3.9 PLANT MATERIAL QUALITY
  - 3.9.1 General Requirements
  - 3.9.2 Growth of Trunk and Crown
    - 3.9.2.1 Deciduous Trees
    - 3.9.2.2 Deciduous Shrubs
    - 3.9.2.3 Coniferous Evergreen Plant Material
    - 3.9.2.4 Broadleaf Evergreen Plant Material
    - 3.9.2.5 Ground Cover and Vine Plant Material
- 3.10 SHRUB AND HEDGE MAINTENANCE
  - 3.10.1 Trimming and Pruning
  - 3.10.2 Shrub Fertilization Program
- 3.11 TREE MAINTENANCE
  - 3.11.1 Trimming and Pruning of Trees
  - 3.11.2 Tree Fertilization Program
  - 3.11.3 Unhealthy Plant Material
- 3.12 RESTORATION AND CLEAN UP
  - 3.12.1 Restoration
  - 3.12.2 Clean Up
- 3.13 CLEANING OF PAVED AREAS

-- End of Section Table of Contents --

SECTION 02935

EXTERIOR PLANT MATERIAL MAINTENANCE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A300 (1995) Tree Care Operations - Trees,  
Shrubs and other Woody Plant Maintenance

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602 (1995a) Agricultural Liming Materials

ASTM D 4972 (1995a) pH of Soils

ASTM D 5883 (1996e1) Use of Rotary Kiln Produced  
Expanded Shale, Clay or Slate (ESCS) as a  
Mineral Amendment in Topsoil Used for  
Landscaping and Related Purpose

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Chemical Treatment Material; GA

Manufacturer's literature including physical characteristics, application and installation instructions for chemical treatment material.

Work Plan and Schedule; GA  
Delivery Schedule; GA

Contractor's work plan and schedules.

Maintenance Record; GA

Contractor's record of each site visit.

Application of Pesticide; GA



Pesticide treatment plan with sequence of treatment work with dates and times. The pesticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area treated, amount applied; and the name and state license number of the state certified applicator shall be included.

#### SD-13 Certificates

pH Adjuster; GA  
Fertilizer; GA  
Mulch; GA  
Pesticide; GA

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

- a. pH Adjuster. Calcium carbonate equivalent and sieve analysis.
- b. Fertilizer. Chemical analysis and composition percent.
- c. Mulch: Composition and source.
- d. Pesticide. EPA registration number and registered uses.

### 1.3 DELIVERY, INSPECTION, STORAGE, AND HANDLING

#### 1.3.1 Delivery Schedule

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

#### 1.3.2 Delivery of Pesticides

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

#### 1.3.3 Storage

Materials shall be stored in designated areas. Lime and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with seeding operation materials.

#### 1.3.4 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

## PART 2 PRODUCTS

### 2.1 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material

and soil conditioners meeting the following requirements. Vermiculite shall not be used.

#### 2.1.1 pH Adjuster

The pH adjuster shall be an agricultural liming material in accordance with ASTM C 602. These materials may be burnt lime, hydrated lime, ground limestone, sulfur, or shells. The pH adjuster shall be used to create a favorable soil pH for the plant material specified or in place.

##### 2.1.1.1 Limestone

Limestone material shall contain a minimum calcium carbonate equivalent of 80 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 55 percent shall pass through a No. 60 sieve. To raise soil pH, ground limestone shall be used.

##### 2.1.1.2 Hydrated Lime

Hydrated lime shall contain a minimum calcium carbonate equivalent of 110 percent. Gradation: A minimum 100 percent shall pass through a No. 8 sieve and a minimum 97 percent shall pass through a No. 60 sieve.

##### 2.1.1.3 Burnt Lime

Burnt lime shall contain a minimum calcium carbonate equivalent of 140 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 35 percent shall pass through a No. 60 sieve.

#### 2.1.2 Fertilizer

Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. The nutrients ratio shall be 5 percent nitrogen, 10 percent phosphorus, and 5 percent potassium. The fertilizer shall be derived from sulfur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

##### 2.1.3 Nitrogen Carrier Fertilizer

Nitrogen carrier fertilizer shall be commercial grade, free flowing, and uniform in composition. The nutrients ratio shall be 5 percent nitrogen, 10 percent phosphorus, and 5 percent potassium. The fertilizer may be a liquid nitrogen solution.

##### 2.1.4 Organic Material

Organic material shall consist of bonemeal, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

###### 2.1.4.1 Bonemeal

Bonemeal shall be finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

###### 2.1.4.2 Rotted Manure

Rotted manure shall be unleached horse, chicken or cattle manure containing

a maximum 25 percent by volume of straw, sawdust, or other bedding materials. It shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds.

#### 2.1.4.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall consist of ground bark, sawdust, yard trimmings, or other wood waste material that is free of stones, sticks, soil, and toxic substances harmful to plants, and is fully composted or stabilized with nitrogen.

#### 2.1.4.4 Recycled Compost

Recycled compost shall be well decomposed, stable, weed free organic matter source. Compost shall be derived from food; agricultural or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length.

#### 2.1.4.5 Worm Castings

Worm castings shall be screened from worms and food source, commercially packaged.

#### 2.1.5 Soil Conditioner

Soil conditioner shall be sand, super absorbent polymers, calcined clay, or gypsum for use singly or in combination.

##### 2.1.5.1 Sand

Sand shall be clean and free of toxic materials. Gradation: A minimum 95 percent by weight shall pass a No. 10 sieve and a minimum 10 percent by weight shall pass a No. 16 sieve. Green sand shall be balanced with the inclusion of trace minerals and nutrients.

##### 2.1.5.2 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to a minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent shall pass a No. 8 sieve; a minimum 99 percent shall be retained on a No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

##### 2.1.5.3 Gypsum

Gypsum shall be commercially packaged, free flowing, and a minimum 95 percent calcium sulfate by volume.

##### 2.1.5.4 Expanded Shale, Clay, or Slate (ESCS)

Rotary kiln produced ESCS material shall conform to ASTM D 5883.

## 2.2 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region. Rotted manure shall not be used.

### 2.2.1 Organic Mulch

Organic mulch materials shall be native to the project site and consist of shredded bark for use when remulching trees, shrubs, and ground covers.

#### 2.2.1.1 Shredded Bark

Locally shredded material shall be treated to retard the growth of mold and fungi.

## 2.3 WATER

Water shall be the responsibility of the Contractor. Water shall not contain elements toxic to plant life.

## 2.4 PESTICIDE

Pesticide shall be an insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification, a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

## 2.5 HERBICIDE

Herbicide shall be EPA registered and approved; furnished for preemergence and postemergence application for crabgrass control and broad leaf weed control and complying with Federal Insecticide, Fungicide, and Rodenticide Act (Title 7 U.S.C. Section 136) for requirements on Contractor's licensing, certification, and record keeping. Contractor shall keep records of all pesticide applications and forward data monthly to Contracting Officer. Record keeping format shall be submitted to Contracting Officer for approval.

## PART 3 EXECUTION

### 3.1 SOIL TESTS

Contractor shall perform soil tests in accordance with ASTM D 4972.

### 3.2 MULCHING

Mulch shall be mixed and applied in accordance with the manufacturer's recommendations.

### 3.3 WATERING

Water to supplement rainfall shall be applied at a rate sufficient to ensure plant growth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

### 3.4 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program.

#### 3.4.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control.

#### 3.4.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended to prevent the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately. A pesticide plan shall be submitted.

### 3.5 GENERAL MAINTENANCE REQUIREMENTS

#### 3.5.1 Pesticide Treatment

Pesticide treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

#### 3.5.2 Maintenance Record

A record of each site visit shall be furnished, describing:

- a. Maintenance work performed.
- b. Areas repaired or reinstalled.
- c. Diagnosis for unsatisfactory stand of grass.
- d. Diagnosis for unsatisfactory stand of plant material in planting bed.
- e. Condition of trees.
- f. Condition of shrubs.
- g. Quantity and diagnosis of plant loss.

### 3.6 GRASS PLANT QUALITY

Grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch high. The living grass area shall be maintained to be uniform in color and leaf texture; and free from weeds and other undesirable growth. The living grass area shall be relatively free of thatch, diseases, nematodes, soil-borne insects, weeds or undesirable plants, stones larger than 1 inch in diameter, woody plant roots, and other materials detrimental to a healthy stand of grass plants. Broadleaf weeds

and patches of foreign grasses shall be a maximum 2 percent of the total area.

#### 3.6.1 Lawn Area

A satisfactory stand of grass plants for a lawn area shall be a minimum 20 grass plants per square foot. Bare spots shall be a maximum 6 9 inches square. The total bare spots shall be a maximum 2 percent of the total area.

#### 3.6.2 Field Area

A satisfactory stand of grass plants for a field area shall be a minimum 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

### 3.7 LAWN AND FIELD AREAS MAINTENANCE

#### 3.7.1 Mowing

Lawn and field areas shall be mowed throughout the growing season to meet the requirements of paragraph GRASS PLANT QUALITY. Cutting height shall be adjusted according to type of grass. Frequency of mowing shall be adjusted so that no more than 1/4 of leaf length is removed during a cutting.

##### 3.7.1.1 Lawn Areas

Lawn areas shall be mowed to a minimum 3 inch height when the turf is a maximum 4-1/2 inches high. Remove clippings when the amount cut prevents sunlight from reaching the ground surface.

##### 3.7.1.2 Field Areas

Field areas shall be mowed 3 times during the season to a minimum 3 inch height. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.

#### 3.7.2 Turf Trimming

Turf adjoining paved areas, planting beds and trees shall be kept neatly trimmed at all times, essentially after each mowing. String trimmers at trees and shrubs will be prohibited.

#### 3.7.3 Aeration

Turf areas shall be aerated once per year using approved devices. Coring shall be performed by pulling soil plugs to minimum of 4 inches. Soil plugs produced in turf areas shall be left in place.

#### 3.7.4 Lime

Lime for pH modification shall be applied as required to meet the requirements of paragraph GRASS PLANT QUALITY.

#### 3.7.5 Herbicide Weed Control

Two or more applications of a pre-emergent herbicide and of a post-emergent herbicide shall be performed to meet the requirements of paragraph GRASS PLANT QUALITY.

### 3.7.6 Turf Fertilization Program

A regular program of fertilization shall be established to include a spring feeding and early summer feeding to meet the requirements of paragraph GRASS PLANT QUALITY. A total of four pounds of Nitrogen per 1000 square feet shall be applied annually. Additional one pound Nitrogen applications shall be provided as grass color warrants.

## 3.8 PLANTING BEDS MAINTENANCE

### 3.8.1 Trimming

Spent flower heads shall be removed. Seasonal succession of bloom requires removal for new plant or trimming back bulb foliage.

### 3.8.2 Weed Control

Grass and weeds in planting beds shall be completely removed before reaching 3 inches in height.

## 3.9 PLANT MATERIAL QUALITY

### 3.9.1 General Requirements

Plant material shall be identified as native to the region of the site or as a specimen. Plant material shall be maintained as well shaped, well grown, vigorous plant material having healthy root systems. The plant material shall be maintained as free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plant material shall be free of shock or damage to branches, trunk, or root systems. Plant quality is determined by the growing conditions; climate and microclimate of the site for maintaining a healthy root system; and growth of the trunk and crown as follows.

### 3.9.2 Growth of Trunk and Crown

#### 3.9.2.1 Deciduous Trees

Deciduous tree height to caliper relationship shall be maintained. Height of branching shall bear a relationship to the size and species of the tree and with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

- a. Single stem: The trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.
- b. Multi-stem: To be considered a stem, there shall be no division of the trunk which branches more than 6 inches from ground level.
- c. Specimen: The tree shall be well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be indicated.

#### 3.9.2.2 Deciduous Shrubs

Deciduous shrub height to number of primary stems shall be maintained. Shrubs shall be maintained as well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the site.

### 3.9.2.3 Coniferous Evergreen Plant Material

Coniferous evergreen plant material height-to-spread ratio shall be maintained. The coniferous evergreen trees shall not be "poled" or the leader removed. The plant material shall be maintained to be well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired shall be indicated.

### 3.9.2.4 Broadleaf Evergreen Plant Material

Broadleaf evergreen plant material height-to-spread ratio shall be maintained. The plant material shall be shaped to be recognized by the trade as typical for the variety grown in the region of the site.

### 3.9.2.5 Ground Cover and Vine Plant Material

Ground cover and vine plant material shall be maintained to have a heavy, well developed, and balanced crown with vigorous, well developed root system.

## 3.10 SHRUB AND HEDGE MAINTENANCE

### 3.10.1 Trimming and Pruning

Trimming shall be performed to ensure the following:

- a. Safety.
- b. Quality (size, height, and shape).
- c. Health (removing broken, diseased branches).
- d. Rejuvenation (removing one third to one half of the older stems or branches).
- e. Visibility (signs, building entrances, motorist line of sight).

Shrubs shall be pruned to the requirements of paragraph PLANT MATERIAL QUALITY. Pruning shall be accomplished by trained and experienced personnel in accordance with ANSI A300. The typical growth habit of individual plant material or the theme shape of the hedge shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed.

### 3.10.2 Shrub Fertilization Program

A regular program of fertilization shall be established to include a fall feeding to meet the requirements of paragraph PLANT MATERIAL QUALITY. Use industry standards for foliage and root fertilizing the plant material inventoried.

## 3.11 TREE MAINTENANCE

### 3.11.1 Trimming and Pruning of Trees

Trimming shall be performed to ensure the following:

- a. Safety.



- b. Quality (size, height).
- c. Health (removing broken, diseased wood branches).
- d. Rejuvenation (removing one third to one half of the older stems or branches).
- e. Visibility (signs, building entrances, motorist line of sight).

Trees shall be pruned to meet the requirements of paragraph PLANT MATERIAL QUALITY. Pruning shall be accomplished by trained and experienced personnel in accordance with ANSI A300. The typical growth habit of individual plant material shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off".

#### 3.11.2 Tree Fertilization Program

A regular program of fertilization shall be established to include a fall feeding to meet the requirements of paragraph PLANT MATERIAL QUALITY. Use industry standards for foliage and root fertilizing the plant material inventoried.

#### 3.11.3 Unhealthy Plant Material

A tree shall be considered unhealthy or dead when the main leader has died back, or up to a maximum 25 percent of the crown has died. A shrub shall be considered unhealthy or dead when up to a maximum 25 percent of the plant has died. This condition shall be determined by scraping on a branch an area 1/16 inch square, maximum, to determine if there is a green cambium layer below the bark. The Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be removed immediately.

### 3.12 RESTORATION AND CLEAN UP

#### 3.12.1 Restoration

Existing turf areas, pavements, and facilities that have been damaged from the maintenance operations shall be restored to original condition at Contractor's expense.

#### 3.12.2 Clean Up

Excess and waste material shall be removed from the maintenance areas and dispose off site. Adjacent paved areas shall be cleaned as determined by the Contracting Officer.

### 3.13 CLEANING OF PAVED AREAS

Grass, weeds, leaves, and debris from mowing, clipping, and pruning shall be removed immediately. Excess and waste material shall be removed from paved areas and disposed off site. Debris, leaves shall be removed monthly.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 03 - CONCRETE

SECTION 03100

STRUCTURAL CONCRETE FORMWORK

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DESIGN
- 1.4 STORAGE AND HANDLING

PART 2 PRODUCTS

- 2.1 FORM MATERIALS
  - 2.1.1 Forms For Class A and Class B Finish
  - 2.1.2 Forms For Class C Finish
  - 2.1.3 Forms For Class D Finish
  - 2.1.4 Retain-In-Place Metal Forms
  - 2.1.5 Pan-Form Units
  - 2.1.6 Form Ties
  - 2.1.7 Form Releasing Agents

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Formwork
- 3.2 CHAMFERING
- 3.3 COATING
- 3.4 REMOVAL OF FORMS

-- End of Section Table of Contents --

SECTION 03100

STRUCTURAL CONCRETE FORMWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 347R (1994) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA ANSI/AHA A135.4 (1995) Basic Hardboard

DEPARTMENT OF COMMERCE (DOC)

DOC PS 1 (1996) Voluntary Product Standard -  
Construction and Industrial Plywood

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Design; FIO

Design analysis and calculations for form design and methodology used in the design.

Form Materials; FIO

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

Form Releasing Agents; FIO

Manufacturer's recommendation on method and rate of application of form releasing agents.

SD-04 Drawings

Formwork; FIO

Drawings showing details of formwork, including dimensions of fiber voids, joints, supports, studding and shoring, and sequence of form and shoring removal.

### 1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

### 1.4 STORAGE AND HANDLING

Fiber voids shall be stored above ground level in a dry location. Fiber voids shall be kept dry until installed and overlaid with concrete.

## PART 2 PRODUCTS

### 2.1 FORM MATERIALS

See Section 03360 SIMULATED STONE MASONRY for architectural form liner requirements.

#### 2.1.1 Forms For Class A and Class B Finish

Forms for Class A and Class B finished surfaces shall be plywood panels conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels. Forms for round columns shall be the prefabricated seamless type.

#### 2.1.2 Forms For Class C Finish

Forms for Class C finished surfaces shall be shiplap lumber; plywood conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II; tempered concrete form hardboard conforming to AHA ANSI/AHA A135.4; other approved concrete form material; or steel, except that steel lining on wood sheathing shall not be used. Forms for round columns may have one vertical seam.

#### 2.1.3 Forms For Class D Finish

Forms for Class D finished surfaces, except where concrete is placed against earth, shall be wood or steel or other approved concrete form material.

#### 2.1.4 Retain-In-Place Metal Forms

Retain-in-place metal forms for concrete slabs and roofs shall be as specified in Section 05300 STEEL DECKING.

#### 2.1.5 Pan-Form Units

Pan-form units for one-way or two-way concrete joist and slab construction shall be factory-fabricated units of the approximate section indicated. Units shall consist of steel or molded fiberglass concrete form pans.

Closure units shall be furnished as required.

#### 2.1.6 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter.

#### 2.1.7 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Formwork

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE and conforming to construction tolerance given in TABLE 1. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, the forms shall fit over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker.

##### 3.2 CHAMFERING

Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled, or rounded by moldings placed in the forms.

##### 3.3 COATING

Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for Class C and D finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures, coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

##### 3.4 REMOVAL OF FORMS

Forms shall be removed preventing injury to the concrete and ensuring the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. Supporting forms or shores shall not be removed before the concrete strength has reached 70 percent of design strength, as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

TABLE 1

TOLERANCES FOR FORMED SURFACES

|   |  |
|---|--|
| 1. Variations from the plumb:   | In any 10 feet of length ----- 1/4 inch  |
| a. In the lines and surfaces of columns, piers, walls and in arises                                     | Maximum for entire length ----- 1 inch   |
| b. For exposed corner columns, control-joint grooves, and other conspicuous lines                       | In any 20 feet of length ----- 1/4 inch<br>Maximum for entire length----- 1/2 inch               |
| 2. Variation from the level or from the grades indicated on the drawings:                               | In any 10 feet of length -----1/4 inch<br>In any bay or in any 20 feet of length----- 3/8 inch   |
| a. In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores | Maximum for entire length ----- 3/4 inch   |
| b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines                 | In any bay or in any 20 feet of length ----- 1/4 inch<br>Maximum for entire length----- 1/2 inch |
| 3. Variation of the linear building lines from established position in plan                             | In any 20 feet ----- 1/2 inch<br>Maximum -----1 inch   |

TABLE 1

TOLERANCES FOR FORMED SURFACES

|                      |  |   |
|----------------------|--|---|
| 4.                   | Variation of distance between walls, columns, partitions   | 1/4 inch per 10 feet of distance, but not more than 1/2 inch in any one bay, and not more than 1 inch total variation     |
| 5.                   | Variation in the sizes and locations of sleeves, floor openings, and wall opening                    | Minus ----- 1/4 inch<br>Plus ----- 1/2 inch   |
| 6.                   | Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls | Minus ----- 1/4 inch<br>Plus ----- 1/2 inch   |
| 7.                   | Footings:  |   |
| a.                   | Variation of dimensions in plan  | Minus ----- 1/2 inch<br>Plus ----- 2 inches<br>when formed or plus 3 inches<br>when placed against unformed<br>excavation |
| b.                   | Misplacement of eccentricity   | 2 percent of the footing<br>width in the direction of<br>misplacement but not more than<br>2 inches                       |
| c.                   | Reduction in thickness of specified thickness  | Minus ----- 5 percent   |
| 8.                   | Variation in steps:  | Riser ----- 1/8 inch  |
| a.                   | In a flight of stairs  | Tread ----- 1/4 inch  |
| b.                   | In consecutive steps   | Riser ----- 1/16 inch<br>Tread ----- 1/8 inch   |
| -- End of Section -- |  |   |

SECTION TABLE OF CONTENTS

DIVISION 03 - CONCRETE

SECTION 03150

EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY AND STORAGE

PART 2 PRODUCTS

- 2.1 CONTRACTION JOINT STRIPS
- 2.2 PREFORMED EXPANSION JOINT FILLER
- 2.3 SEALANT
  - 2.3.1 Preformed Polychloroprene Elastomeric Type
  - 2.3.2 Lubricant for Preformed Compression Seals
  - 2.3.3 Field-Molded Type
- 2.4 WATERSTOPS
  - 2.4.1 Non-Metallic Materials
  - 2.4.2 Non-Metallic Hydrophilic
- 2.5 COMPRESSION SEALS

PART 3 EXECUTION

- 3.1 JOINTS
  - 3.1.1 Contraction Joints
    - 3.1.1.1 Joint Strips
    - 3.1.1.2 Sawed Joints
  - 3.1.2 Expansion Joints
  - 3.1.3 Joint Sealant
    - 3.1.3.1 Joints With Preformed Compression Seals
    - 3.1.3.2 Joints With Field-Molded Sealant
- 3.2 WATERSTOPS, INSTALLATION AND SPLICES
  - 3.2.1 Rubber Waterstop
  - 3.2.2 Polyvinyl Chloride Waterstop
  - 3.2.3 Quality Assurance
  - 3.2.4 Non-Metallic Hydrophilic Waterstop Installation
- 3.3 CONSTRUCTION JOINTS

-- End of Section Table of Contents --



SECTION 03150

EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1995) Basic Hardboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |   |
|-------------|---|
| ASTM C 919  | (1984; R 1998) Use of Sealants in Acoustical Applications   |
| ASTM C 920  | (1998) Elastomeric Joint Sealants   |
| ASTM D 412  | (1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension  |
| ASTM D 1751 | (1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) |
| ASTM D 1752 | (1984; R 1996el) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction             |
| ASTM D 2000 | (1999) Rubber Products in Automotive Applications   |
| ASTM D 2628 | (1991; R 1998) Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements   |
| ASTM D 2835 | (1989; R 1998) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements  |
| ASTM D 3542 | (1998) Preformed Polychloroprene Elastomeric Joint Seals for Bridges  |
| ASTM D 5249 | (1995) Backer Material for Use With Cold and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints                |

CORPS OF ENGINEERS (COE)

COE CRD-C 513 (1974) Corps of Engineers Specifications  
for Rubber Waterstop

COE CRD-C 572 (1974) Corps of Engineers Specifications  
for Polyvinylchloride Waterstop

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Preformed Expansion Joint Filler; FIO  
Sealant; FIO  
Waterstops; FIO

Manufacturer's literature, including safety data sheets, for preformed fillers and the lubricants used in their installation; field-molded sealants and primers (when required by sealant manufacturer); preformed compression seals; and waterstops.

SD-04 Drawings

Waterstops; FIO

Shop drawings and fabrication drawings provided by the manufacturer or prepared by the Contractor. Shop drawings must include the proposed location and station for every type of expansion and/or contraction joint in flood walls.

SD-13 Certificates

Waterstops; FIO

Certificates of compliance stating that the joint filler and sealant materials and waterstops conform to the requirements specified.

SD-14 Samples

Lubricant for Preformed Compression Seals; FIO

Specimens identified to indicate the manufacturer, type of material, size and quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 9 ft of 1 inch nominal width or wider seal or a piece not less than 12 ft of compression seal less than 1 inch nominal width. One quart of lubricant shall be provided. Sample compression seals shall be submitted in the proposed color.

Non-metallic Materials; FIO

Specimens identified to indicate manufacturer, type of material, size, quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 12 inch long cut from each

200 ft of finished waterstop furnished, but not less than a total of 4 ft of each type, size, and lot furnished. One splice sample of each size and type for every 50 splices made in the factory and every 10 splices made at the job site. The splice samples shall be made using straight run pieces with the splice located at the mid-length of the sample and finished as required for the installed waterstop. The total length of each splice shall be not less than 12 inches long.

### 1.3 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

## PART 2 PRODUCTS

### 2.1 CONTRACTION JOINT STRIPS

Contraction joint strips shall be 1/8 inch thick tempered hardboard conforming to AHA A135.4, Class 1. In lieu of hardboard strips, rigid polyvinylchloride (PVC) or high impact polystyrene (HIPS) insert strips specifically designed to induce controlled cracking in slabs on grade may be used. Such insert strips shall have removable top section.

### 2.2 PREFORMED EXPANSION JOINT FILLER

Expansion joint filler shall be preformed material conforming to ASTM D 1751 or ASTM D 1752. Unless otherwise indicated, filler material shall be 3/8 inch thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D 5249.

### 2.3 SEALANT

Joint sealant shall conform to the following:

#### 2.3.1 Preformed Polychloroprene Elastomeric Type

ASTM D 2628.

#### 2.3.2 Lubricant for Preformed Compression Seals

ASTM D 2835.

#### 2.3.3 Field-Molded Type

ASTM C 920, Type M for horizontal joints or Type NS for vertical joints, Class 25, and Use NT. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type materials. The back-up material shall be compressible, non-shrink, nonreactive with sealant, and non-absorptive material type such as extruded butyl or polychloroprene rubber.

### 2.4 WATERSTOPS

Intersection and change of direction waterstops shall be shop fabricated.

#### 2.4.1 Non-Metallic Materials`

Non-metallic waterstops shall be manufactured from a prime virgin resin; reclaimed material is not acceptable. The compound shall contain plasticizers, stabilizers, and other additives to meet specified requirements. Rubber waterstops shall conform to COE CRD-C 513. Polyvinylchloride waterstops shall conform to COE CRD-C 572. PVC waterstops with center bulb shall be used in the continuous flood walls (not in transition walls).

#### 2.4.2 Non-Metallic Hydrophilic

Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water shall conform to ASTM D 412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness shall be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F shall be 3 to 1 minimum.

#### 2.5 COMPRESSION SEALS

Compression seals shall be manufactured from extruded elastomeric neoprene materials or thermo-rubber EPDM materials to blend with the color of the adjacent concrete or brick veneer wall treatment. Neoprene sealer shall meet the requirements of ASTM D 3542, exclusive of recovery and force-deflection material. Sealers made from the EPDM-based material shall meet ASTM D 2000.

### PART 3 EXECUTION

#### 3.1 JOINTS

Joints shall be installed at locations indicated and as authorized.

##### 3.1.1 Contraction Joints

Contraction joints may be constructed by inserting tempered hardboard strips or rigid PVC or HIPS insert strips into the plastic concrete using a steel parting bar, when necessary, or by cutting the concrete with a saw after concrete has set. Joints shall be approximately 1/8 inch wide and shall extend into the slab one-fourth the slab thickness, minimum, but not less than 1 inch.

##### 3.1.1.1 Joint Strips

Strips shall be of the required dimensions and as long as practicable. After the first floating, the concrete shall be grooved with a tool at the joint locations. The strips shall be inserted in the groove and depressed until the top edge of the vertical surface is flush with the surface of the slab. The slab shall be floated and finished as specified. Working of the concrete adjacent to the joint shall be the minimum necessary to fill voids and consolidate the concrete. Where indicated, the top portion of the strip shall be sawed out after the curing period to form a recess for sealer. The removable section of PVC or HIPS strips shall be discarded and the insert left in place. True alignment of the strips shall be maintained during insertion.

##### 3.1.1.2 Sawed Joints

Joint sawing shall be early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable

spalling. Concrete sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed.

### 3.1.2 Expansion Joints

Preformed expansion joint filler shall be used in expansion and isolation joints in slabs around columns and between slabs on grade and vertical surfaces where indicated. The filler shall extend the full slab depth, unless otherwise indicated. The edges of the joint shall be neatly finished with an edging tool of 1/8 inch radius, except where a resilient floor surface will be applied. Where the joint is to receive a sealant, the filler strips shall be installed at the proper level below the finished floor with a slightly tapered, dressed and oiled wood strip temporarily secured to the top to form a recess to the size shown on the drawings. The wood strip shall be removed after the concrete has set. Contractor may opt to use a removable expansion filler cap designed and fabricated for this purpose in lieu of the wood strip. The groove shall be thoroughly cleaned of laitance, curing compound, foreign materials, protrusions of hardened concrete, and any dust which shall be blown out of the groove with oil-free compressed air.

### 3.1.3 Joint Sealant

Sawed contraction joints and expansion joints in slabs shall be filled with joint sealant, unless otherwise shown. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant.

#### 3.1.3.1 Joints With Preformed Compression Seals

Compression seals shall be installed with the vacuum equipment capable of installing joint seals to the prescribed depth without cutting, nicking, twisting, or otherwise distorting or damaging the seal or concrete and with no more than 5 percent stretching of the seal. The sides of the joint and, if necessary, the sides of the compression seal shall be covered with a coating of lubricant. Butt joints shall be coated with liberal applications of lubricant.

All surfaces to receive the compression seal profile shall be dry, clean, sound concrete free of loose, cracked, delaminated and spalled sections. Repair any sections that do not meet this criteria. The surfaces to receive the seal shall be sandblasted to exposed aggregate. Sandblasting shall increase surface area to increase bond capacity of the adhesive, and remove all laitance and other bond-inhibiting contaminants.

#### 3.1.3.2 Joints With Field-Molded Sealant

Joints shall not be sealed when the sealant material, ambient air, or concrete temperature is less than 40 degrees F. When the sealants are meant to reduce the sound transmission characteristics of interior walls, ceilings, and floors the guidance provided in ASTM C 919 shall be followed. Joints requiring a bond breaker shall be coated with curing compound or with bituminous paint. Bond breaker and back-up material shall be installed where required. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

### 3.2 WATERSTOPS, INSTALLATION AND SPLICES

Waterstops shall be installed at the locations shown to form a continuous water-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Any waterstop punctured or damaged shall be repaired or replaced. Exposed waterstops shall be protected during application of form release agents to avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Splices shall be made by certified trained personnel using approved equipment and procedures.

#### 3.2.1 Rubber Waterstop

Splices shall be vulcanized or shall be made using cold bond adhesive as recommended by the manufacturer. Splices for TPE-R shall be as specified for PVC.

#### 3.2.2 Polyvinyl Chloride Waterstop

Splices shall be made by heat sealing the adjacent waterstop edges together using a thermoplastic splicing iron utilizing a non-stick surface specifically designed for waterstop welding. The correct temperature shall be used to sufficiently melt without charring the plastic. The spliced area, when cooled, shall show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.

#### 3.2.3 Quality Assurance

Edge welding will not be permitted. Centerbulbs shall be compressed or closed when welding to non-centerbulb type. Waterstop splicing defects which are unacceptable include, but are not limited to the following: 1) Tensile strength less than 80 percent of parent section. 2) Free lap joints. 3) Misalignment of centerbulb, ribs, and end bulbs greater than 1/16 inch. 4) Misalignment which reduces waterstop cross section more than 15 percent. 5) Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness. 6) Misalignment of waterstop splice resulting in misalignment of waterstop in excess of 1/2 inch in 10 feet. 7) Visible porosity in the weld area, including pin holes. 8) Charred or burnt material. 9) Bubbles or inadequate bonding. 10) Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.

#### 3.2.4 Non-Metallic Hydrophilic Waterstop Installation

Ends to be joined shall be miter cut with sharp knife or shears. The ends shall be adhered with cyanacrylate (super glue) adhesive. When joining hydrophilic type waterstop to PVC waterstop, the hydrophilic waterstop shall be positioned as shown on the drawings. A liberal amount of a single component hydrophilic sealant shall be applied to the junction to complete the transition.

### 3.3 CONSTRUCTION JOINTS

Construction joints are specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE except that construction joints coinciding with expansion and contraction joints shall be treated as expansion or contraction joints as applicable.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 03 - CONCRETE

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 WELDING
- 1.4 DELIVERY AND STORAGE

PART 2 PRODUCTS

- 2.1 DOWELS
- 2.2 FABRICATED BAR MATS
- 2.3 REINFORCING STEEL
- 2.4 WIRE TIES
- 2.5 SUPPORTS

PART 3 EXECUTION

- 3.1 REINFORCEMENT
  - 3.1.1 Placement
  - 3.1.2 Splicing
- 3.2 DOWEL INSTALLATION

-- End of Section Table of Contents --



SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

|              |   |
|--------------|---|
| ACI 318/318R | (1999) Building Code Requirements for Reinforced Concrete |
|--------------|---|

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|           |   |
|-----------|---|
| ASTM A 53 | (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
|-----------|---|

|           |   |
|-----------|---|
| ASTM A 82 | (1997a) Steel Wire, Plain, for Concrete Reinforcement |
|-----------|---|

|                   |  |
|-------------------|--|
| ASTM A 184/A 184M | (1996) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement |
|-------------------|--|

|                   |  |
|-------------------|--|
| ASTM A 615/A 615M | (1996a <sub>el</sub> ) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement |
|-------------------|--|

|                   |  |
|-------------------|--|
| ASTM A 675/A 675M | (1990a; R 1995 <sub>el</sub> ) Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties |
|-------------------|--|

|                   |   |
|-------------------|---|
| ASTM A 706/A 706M | (1998) Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement |
|-------------------|---|

|                   |  |
|-------------------|--|
| ASTM A 767/A 767M | (1997) Zinc-Coated (Galvanized) Steel Bars in Concrete Reinforcement |
|-------------------|--|

|                   |   |
|-------------------|---|
| ASTM A 775/A 775M | (1997 <sub>el</sub> ) Epoxy-Coated Reinforcement Steel Bars |
|-------------------|---|

AMERICAN WELDING SOCIETY (AWS)

|          |  |
|----------|--|
| AWS D1.4 | (1998) Structural Welding Code - Reinforcing Steel |
|----------|--|

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

|            |                                    |
|------------|------------------------------------|
| CRSI MSP-1 | (1996) Manual of Standard Practice |
|------------|------------------------------------|

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

#### Welding; FIO

A list of qualified welders names.

### SD-04 Drawings

#### Reinforcement; GA

Detail drawings showing reinforcing steel placement, schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes and spacing.

### SD-13 Certificates

#### Reinforcing Steel; FIO

Certified copies of mill reports attesting that the reinforcing steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified herein, prior to the installation of reinforcing steel.

#### Splicing Lap Lengths; FIO

Certified copies of schedules for splice lengths for all reinforcing bars scheduled for different uses and locations including top bars.

## 1.3 WELDING

Welders shall be qualified in accordance with AWS D1.4. Qualification test shall be performed at the worksite and the Contractor shall notify the Contracting Officer 24 hours prior to conducting tests. Special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4.

## 1.4 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

## PART 2 PRODUCTS

### 2.1 DOWELS

Dowels shall conform to ASTM A 675/A 675M, Grade 60. Steel pipe conforming to ASTM A 53, Schedule 80, may be used as dowels provided the ends are closed with metal or plastic inserts or with mortar.

### 2.2 FABRICATED BAR MATS

Fabricated bar mats shall conform to ASTM A 184/A 184M.

## 2.3 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615/A 615M or ASTM A 706/A 706M, Grade 60 and sizes as indicated on the drawings. Cold drawn wire used for spiral reinforcement shall conform to ASTM A 82. In highly corrosive environments or when directed by the Contracting Officer, reinforcing steel shall conform to ASTM A 767/A 767M or ASTM A 775/A 775M as appropriate.

## 2.4 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

## 2.5 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI MSP-1 and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 1/2 inch of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

# PART 3 EXECUTION

## 3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

### 3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

### 3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made

only as required or indicated. Splicing shall be by lapping, except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 6 inches.

### 3.2 DOWEL INSTALLATION

Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement. One end of dowels shall be coated with a bond breaker.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 03 - CONCRETE

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 QUALIFICATIONS
- 1.4 FIELD TEST PANELS
  - 1.4.1 Sample Wall Panels
- 1.5 GENERAL REQUIREMENTS
  - 1.5.1 Tolerances
    - 1.5.1.1 Floors
    - 1.5.1.2 Floors by the Straightedge System
  - 1.5.2 Strength Requirements and w/c Ratio
    - 1.5.2.1 Strength Requirements
  - 1.5.3 Air Entrainment
  - 1.5.4 Slump
  - 1.5.5 Concrete Temperature
  - 1.5.6 Size of Coarse Aggregate
  - 1.5.7 Special Properties and Products
- 1.6 MIXTURE PROPORTIONS
  - 1.6.1 Proportioning Studies for Normal Weight Concrete
  - 1.6.2 Proportioning Studies for Flexural Strength Concrete
  - 1.6.3 Average Compressive Strength Required for Mixtures
    - 1.6.3.1 Computations from Test Records
    - 1.6.3.2 Computations without Previous Test Records
  - 1.6.4 Average Flexural Strength Required for Mixtures
- 1.7 STORAGE OF MATERIALS
- 1.8 GOVERNMENT ASSURANCE INSPECTION AND TESTING
  - 1.8.1 Materials
  - 1.8.2 Fresh Concrete
  - 1.8.3 Hardened Concrete
  - 1.8.4 Inspection

PART 2 PRODUCTS

- 2.1 CEMENTITIOUS MATERIALS
  - 2.1.1 Portland Cement
  - 2.1.2 High-Early-Strength Portland Cement
  - 2.1.3 Pozzolan (Fly Ash)
- 2.2 AGGREGATES
  - 2.2.1 Fine Aggregate
  - 2.2.2 Coarse Aggregate
- 2.3 CHEMICAL ADMIXTURES
  - 2.3.1 Air-Entraining Admixture
  - 2.3.2 Accelerating Admixture
  - 2.3.3 Water-Reducing or Retarding Admixture
  - 2.3.4 High-Range Water Reducer

- 2.3.5 Surface Retarder
- 2.3.6 Expanding Admixture
- 2.3.7 Other Chemical Admixtures
- 2.4 CURING MATERIALS
  - 2.4.1 Impervious-Sheet
  - 2.4.2 Membrane-Forming Compound
  - 2.4.3 Burlap and Cotton Mat
- 2.5 WATER
- 2.6 NONSHRINK GROUT
- 2.7 NONSLIP SURFACING MATERIAL
- 2.8 LATEX BONDING AGENT
- 2.9 EPOXY RESIN
- 2.10 EMBEDDED ITEMS
- 2.11 JOINT MATERIALS
  - 2.11.1 Joint Fillers, Sealers, and Waterstops
  - 2.11.2 Contraction Joints in Slabs
- 2.12 FLOWABLE CEMENTITIOUS FILL / CONTROLLED DENSITY FILL (CDF)

### PART 3 EXECUTION

- 3.1 PREPARATION FOR PLACING
  - 3.1.1 Foundations
    - 3.1.1.1 Concrete on Earth Foundations
  - 3.1.2 Previously Placed Concrete
    - 3.1.2.1 Air-Water Cutting
    - 3.1.2.2 High-Pressure Water Jet
    - 3.1.2.3 Wet Sandblasting
    - 3.1.2.4 Waste Disposal
  - 3.1.3 Embedded Items
- 3.2 CONCRETE PRODUCTION
  - 3.2.1 Batching, Mixing, and Transporting Concrete
    - 3.2.1.1 General
- 3.3 TRANSPORTING CONCRETE TO PROJECT SITE
- 3.4 CONVEYING CONCRETE ON SITE
  - 3.4.1 Buckets
  - 3.4.2 Transfer Hoppers
  - 3.4.3 Trucks
  - 3.4.4 Chutes
  - 3.4.5 Belt Conveyors
  - 3.4.6 Concrete Pumps
- 3.5 PLACING CONCRETE
  - 3.5.1 Depositing Concrete
  - 3.5.2 Consolidation
  - 3.5.3 Cold Weather Requirements
  - 3.5.4 Hot Weather Requirements
  - 3.5.5 Prevention of Plastic Shrinkage Cracking
- 3.6 JOINTS
  - 3.6.1 Construction Joints
  - 3.6.2 Contraction Joints in Slabs on Grade
  - 3.6.3 Expansion Joints
  - 3.6.4 Waterstops
  - 3.6.5 Dowels and Tie Bars
- 3.7 FINISHING FORMED SURFACES
  - 3.7.1 Class A Finish and Class B Finish
  - 3.7.2 Class C and Class D Finish
  - 3.7.3 Architectural and Special Finishes
- 3.8 REPAIRS
  - 3.8.1 Damp-Pack Mortar Repair
  - 3.8.2 Repair of Major Defects

- 3.8.2.1 Surface Application of Mortar Repair
- 3.8.2.2 Repair of Deep and Large Defects
- 3.9 FINISHING UNFORMED SURFACES
  - 3.9.1 General
  - 3.9.2 Rough Slab Finish
  - 3.9.3 Troweled Finish
  - 3.9.4 Non-Slip Finish
    - 3.9.4.1 Broomed
- 3.10 CURING AND PROTECTION
  - 3.10.1 General
  - 3.10.2 Moist Curing
  - 3.10.3 Membrane Forming Curing Compounds
  - 3.10.4 Impervious Sheeting
  - 3.10.5 Cold Weather Curing and Protection
- 3.11 SETTING BASE PLATES AND BEARING PLATES
  - 3.11.1 Damp-Pack Bedding Mortar
  - 3.11.2 Nonshrink Grout
    - 3.11.2.1 Mixing and Placing of Nonshrink Grout
    - 3.11.2.2 Treatment of Exposed Surfaces
- 3.12 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL
  - 3.12.1 Grading and Corrective Action
    - 3.12.1.1 Fine Aggregate
    - 3.12.1.2 Coarse Aggregate
  - 3.12.2 Quality of Aggregates
  - 3.12.3 Scales, Batching and Recording
  - 3.12.4 Batch-Plant Control
  - 3.12.5 Concrete Mixture
  - 3.12.6 Inspection Before Placing
  - 3.12.7 Placing
  - 3.12.8 Vibrators
  - 3.12.9 Curing Inspection
  - 3.12.10 Cold-Weather Protection
  - 3.12.11 Mixer Uniformity
  - 3.12.12 Reports
- 3.13 FLOWABLE CEMENTITIOUS FILL

-- End of Section Table of Contents --

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

|              |   |
|--------------|---|
| ACI 117/117R | (1990; Errata) Standard Tolerances for Concrete Construction and Materials                                |
| ACI 211.1    | (1991) Selecting Proportions for Normal, Heavyweight, and Mass Concrete                                   |
| ACI 214.3R   | (1988) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete |
| ACI 305R     | (1991) Hot Weather Concreting   |
| ACI 318/318R | (1999) Building Code Requirements for Reinforced Concrete   |

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

|              |   |
|--------------|---|
| AASHTO M 182 | (1991; R 1996) Burlap Cloth Made From Jute or Kenaf |
|--------------|---|

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                 |   |
|-----------------|---|
| ASTM C 31/C 31M | (1998) Making and Curing Concrete Test Specimens in the Field                     |
| ASTM C 33       | (1999ael) Concrete Aggregates   |
| ASTM C 39       | (1996) Compressive Strength of Cylindrical Concrete Specimens                     |
| ASTM C 42       | (1999) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete            |
| ASTM C 78       | (1994) Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading) |
| ASTM C 94       | (1999) Ready-Mixed Concrete   |



Grand Forks Phase 2 Levees

|                     |   |
|---------------------|---|
| ASTM C 136          | (1996a) Sieve Analysis of Fine and Coarse Aggregates  |
| ASTM C 143          | (1998) Slump of Hydraulic Cement Concrete   |
| ASTM C 150          | (1999a) Portland Cement   |
| ASTM C 171          | (1997a) Sheet Materials for Curing Concrete   |
| ASTM C 172          | (1999) Sampling Freshly Mixed Concrete  |
| ASTM C 173          | (1994ael) Air Content of Freshly Mixed Concrete by the Volumetric Method  |
| ASTM C 192/C 192M   | (1998) Making and Curing Concrete Test Specimens in the Laboratory  |
| ASTM C 231          | (1997el) Air Content of Freshly Mixed Concrete by the Pressure Method   |
| ASTM C 260          | (1998) Air-Entraining Admixtures for Concrete   |
| ASTM C 309          | (1998a) Liquid Membrane-Forming Compounds for Curing Concrete   |
| ASTM C 494          | (1999) Chemical Admixtures for Concrete   |
| ASTM C 618          | (1999) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete                         |
| ASTM C 881          | (1999) Epoxy-Resin-Base Bonding Systems for Concrete  |
| ASTM C 937          | (1997) Grout Fluidifier for Preplaced-Aggregate Concrete  |
| ASTM C 940          | (1998a) Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory                   |
| ASTM C 1017         | (1998) Chemical Admixtures for Use in Producing Flowing Concrete  |
| ASTM C 1059         | (1999) Latex Agents for Bonding Fresh to Hardened Concrete  |
| ASTM C 1064/C 1064M | (1999) Temperature of Freshly Mixed Portland Cement Concrete  |
| ASTM C 1077         | (1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation |
| ASTM C 1107         | (1999) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)   |

|             |   |
|-------------|---|
| ASTM D 75   | (1987; R 1997) Sampling Aggregates  |
| ASTM D 1751 | (1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) |
| ASTM D 1752 | (1984; R 1996el) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction             |

CORPS OF ENGINEERS (COE)

|               |   |
|---------------|---|
| COE CRD-C 94  | (1995) Surface Retarders  |
| COE CRD-C 104 | (1980) Method of Calculation of the Fineness Modulus of Aggregate   |
| COE CRD-C 400 | (1963) Requirements for Water for Use in Mixing or Curing Concrete  |
| COE CRD-C 521 | (1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete   |
| COE CRD-C 540 | (1971; R 1981) Standard Specification for Nonbituminous Inserts for Contraction Joints in Portland Cement Concrete Airfield Pavements, Sawable Type |
| COE CRD-C 572 | (1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop  |

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

|                |   |
|----------------|---|
| NRMCA CPMB 100 | (1996) Concrete Plant Standards   |
| NRMCA TMMB 100 | (1994) Truck Mixer Agitator and Front Discharge Concrete Carrier Standards  |
| NRMCA QC 3     | (1984) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready Mixed Concrete Production Facilities |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Mixture Proportions; GA

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of ingredients that will be used in the manufacture of each strength or class of concrete, at least 14 days prior to

commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an approved independent commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

#### SD-09 Reports

Testing and Inspection for Contractor Quality Control; GA

Certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolan, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

#### SD-13 Certificates

Qualifications; FIO

Written documentation for Contractor Quality Control personnel.

### 1.3 QUALIFICATIONS

Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades or shall have written evidence of having completed similar qualification programs:

Concrete Field Testing Technician, Grade I  
Concrete Laboratory Testing Technician, Grade I or II  
Concrete Construction Inspector, Level II

Concrete Transportation Construction Inspector or  
Reinforced Concrete Special Inspector, Jointly certified by American Concrete Institute (ACI), Building Official and Code Administrators International (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International (SBCCI).

The foreman or lead journeyman of the flatwork finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

### 1.4 FIELD TEST PANELS

Field test panels shall be constructed prior to beginning of work using the materials and procedures proposed for use on the job, to demonstrate the results to be attained. The quality and appearance of each panel shall be subject to the approval of the Contracting Officer, and, if not judged satisfactory, additional panels shall be constructed until approval is attained. Formed or finished surfaces in the completed structure shall match the quality and appearance of the approved field example.

#### 1.4.1 Sample Wall Panels

One sample panel at least 4 feet by 5 feet and 12 inches thick shall be constructed to demonstrate Class A formed finish and a similar one for Class B formed finish. Panels shall be located as coordinated with the City of Grand Forks. Each panel shall include a full length and full width joint line and shall have at least two voids each at least 12 inches by 12 inches by 3 inches deep either impressed in the concrete as placed or chipped in the hardened concrete. After the concrete is 7 days old, the voids shall be patched to demonstrate the effectiveness and the appearance of the Contractor's repair procedures. See Section 03360 SIMULATED STONE MASONRY for further sample wall panel requirements.

## 1.5 GENERAL REQUIREMENTS

### 1.5.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

#### 1.5.1.1 Floors

For the purpose of this Section the following terminology correlation between ACI 117/117R and this Section shall apply:

| Floor Profile Quality<br>Classification From ACI 117/117R | This Section                  |
|---|-------------------------------|
| -----   | -----                         |
| Conventional Bullfloated                                  | Same                          |
| Conventional Straightedged                                | Same                          |
| Flat  | Float Finish or Trowel Finish |
| Very Flat   | Same. Use only with F-system  |

Levelness tolerance shall not apply where design requires floors to be sloped to drains or sloped for other reasons.

#### 1.5.1.2 Floors by the Straightedge System

The flatness of the floors shall be carefully controlled and the tolerances shall be measured by the straightedge system as specified in paragraph 4.5.7 of ACI 117/117R, using a 10 foot straightedge, within 72 hours after floor slab installation and before shores and/or forms are removed. The listed tolerances shall be met at any and every location at which the straightedge can be placed.

|               |  |
|---------------|--|
| Bullfloated   | All foundation slabs not exposed to view |
| Straightedged | All foundation slabs not exposed to view |
| Float Finish  | Pumphouse foundation slabs               |
| Trowel Finish | Pumphouse operation floor slab           |

## 1.5.2 Strength Requirements and w/c Ratio

### 1.5.2.1 Strength Requirements

Specified compressive strength (f'c) shall be as follows:

## COMPRESSIVE STRENGTH

## STRUCTURE OR PORTION OF STRUCTURE

4000 psi at 28 days

All concrete work

Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement. Compressive strength shall be determined in accordance with ASTM C 39. Flexural strength shall be determined in accordance with ASTM C 78.

- a. Evaluation of Concrete Compressive Strength. Compressive strength specimens (6 by 12 inch cylinders) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength  $f'_c$  and no individual test result falls below the specified strength  $f'_c$  by more than 500 psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.
- b. Investigation of Low-Strength Compressive Test Results. When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the strength of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. Non-destructive tests (tests other than test cylinders or cores) shall not be used as a basis for acceptance or rejection. The Contractor shall perform the coring and repair the holes. Cores will be tested by the Government.
- c. Load Tests. If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test as being understrength shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed by and at the expense of the Contractor and must be approved by the Contracting Officer, except that if all concrete is found to be in compliance with the drawings and specifications, the cost of investigations, testing, and load tests will be at the

expense of the Government.

- d. Evaluation of Concrete Flexural Strength. Flexural strength specimens (beams) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 78. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified flexural strength and no individual test result falls below the specified flexural strength by more than 50 psi. A "test" is defined as the average of two companion beams. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the slab is considered potentially deficient.

#### 1.5.3 Air Entrainment

Except as otherwise specified for lightweight concrete, all normal weight concrete shall be air entrained to contain between 4 and 7 percent total air, except that when the nominal maximum size coarse aggregate is 3/4 inch or smaller it shall be between 4.5 and 7.5 percent. Concrete with specified strength over 5000 psi may have 1.0 percent less air than specified above. Specified air content shall be attained at point of placement into the forms. Air content for normal weight concrete shall be determined in accordance with ASTM C 231.

#### 1.5.4 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be within the following limits. Slump shall be determined in accordance with ASTM C 143.

| Structural Element   | Minimum | Slump<br>Maximum |
|--|---------|------------------|
| Walls, columns and beams                                   | 2 in.   | 4 in.            |
| Foundation walls, substructure walls, footings, slabs      | 1 in.   | 3 in.            |
| Any structural concrete approved for placement by pumping: |         |                  |
| At pump  | 2 in.   | 6 in.            |
| At discharge of line                                       | 1 in.   | 4 in.            |

When use of a plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C 494 is permitted to increase the slump of concrete, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.

#### 1.5.5 Concrete Temperature

The temperature of the concrete as delivered shall not exceed 90 degrees F.

When the ambient temperature during placing is 40 degrees F or less, or is expected to be at any time within 6 hours after placing, the temperature of the concrete as delivered shall be between 55 and 75 degrees F.

#### 1.5.6 Size of Coarse Aggregate

The largest feasible nominal maximum size aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

#### 1.5.7 Special Properties and Products

Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies.

### 1.6 MIXTURE PROPORTIONS

Concrete shall be composed of portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified.

#### 1.6.1 Proportioning Studies for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Except as specified for flexural strength concrete, mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratios required in subparagraph Water-Cement Ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and ground granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where silica fume or GGBF slag is used, the weight of the silica fume and GGBF slag shall be included in the equations in ACI 211.1 for the term P, which is used to denote the weight of pozzolan. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent by weight of the total cementitious material, and the maximum shall be 35 percent. Laboratory trial mixtures shall be designed for maximum permitted slump and air content. Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use.

No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult

placing locations. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192/C 192M. They shall be tested at 7 and 28 days in accordance with ASTM C 39. From these test results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, a curve shall be plotted showing the relationship between 7 day and 28 day strengths. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding.

#### 1.6.2 Proportioning Studies for Flexural Strength Concrete

Trial design batches, mixture proportioning studies, and testing requirements shall conform to the requirements specified in paragraph Proportioning Studies for Normal Weight Concrete, except that proportions shall be based on flexural strength as determined by test specimens (beams) fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 78. Procedures given in ACI 211.1 shall be modified as necessary to accommodate flexural strength.

#### 1.6.3 Average Compressive Strength Required for Mixtures

The mixture proportions selected during mixture design studies shall produce a required average compressive strength ( $f'_{cr}$ ) exceeding the specified compressive strength ( $f'_c$ ) by the amount indicated below. This required average compressive strength,  $f'_{cr}$ , will not be a required acceptance criteria during concrete production. However, whenever the daily average compressive strength at 28 days drops below  $f'_{cr}$  during concrete production, or daily average 7-day strength drops below a strength correlated with the 28-day  $f'_{cr}$ , the mixture shall be adjusted, as approved, to bring the daily average back up to  $f'_{cr}$ . During production, the required  $f'_{cr}$  shall be adjusted, as appropriate, based on the standard deviation being attained on the job.

##### 1.6.3.1 Computations from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths ( $f'_c$ ) within 1,000 psi of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. Required average compressive strength  $f'_{cr}$  used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

$$f'_{cr} = f'_c + 1.34S \text{ where units are in psi}$$

$$f'_{cr} = f'_c + 2.33S - 500 \text{ where units are in psi}$$

Where  $S$  = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the



calculated standard deviation and a modification factor from the following table:

| NUMBER OF TESTS | MODIFICATION FACTOR<br>FOR STANDARD DEVIATION |
|-----------------|---|
| 15              | 1.16  |
| 20              | 1.08  |
| 25              | 1.03  |
| 30 or more      | 1.00  |

#### 1.6.3.2 Computations without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength  $f'_{cr}$  shall be determined as follows:

- a. If the specified compressive strength  $f'_c$  is less than 3,000 psi,  
 $f'_{cr} = f'_c + 1000 \text{ psi}$
- b. If the specified compressive strength  $f'_c$  is 3,000 to 5,000 psi,  
 $f'_{cr} = f'_c + 1,200 \text{ psi}$
- c. If the specified compressive strength  $f'_c$  is over 5,000 psi,  
 $f'_{cr} = f'_c + 1,400 \text{ psi}$

#### 1.6.4 Average Flexural Strength Required for Mixtures

The mixture proportions selected during mixture design studies for flexural strength mixtures and the mixture used during concrete production shall be designed and adjusted during concrete production as approved, except that the overdesign for average flexural strength shall simply be 15 percent greater than the specified flexural strength at all times.

#### 1.7 STORAGE OF MATERIALS

Cement and other cementitious materials shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants and keep each material completely separated. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements. Materials shall be capable of being accurately identified after bundles or containers are opened.

#### 1.8 GOVERNMENT ASSURANCE INSPECTION AND TESTING

Day-to day inspection and testing shall be the responsibility of the Contractor Quality Control (CQC) staff. However, representatives of the Contracting Officer can and will inspect construction as considered

appropriate and will monitor operations of the Contractor's CQC staff. Government inspection or testing will not relieve the Contractor of any of his CQC responsibilities.

#### 1.8.1 Materials

The Government will sample and test aggregates, cementitious materials, other materials, and concrete to determine compliance with the specifications as considered appropriate. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Other materials will be sampled from storage at the jobsite or from other locations as considered appropriate. Samples may be placed in storage for later testing when appropriate.

#### 1.8.2 Fresh Concrete

Fresh concrete will be sampled as delivered in accordance with ASTM C 172 and tested in accordance with these specifications, as considered necessary.

#### 1.8.3 Hardened Concrete

Tests on hardened concrete will be performed by the Government when such tests are considered necessary.

#### 1.8.4 Inspection

Concrete operations may be tested and inspected by the Government as the project progresses. Failure to detect defective work or material will not prevent rejection later when a defect is discovered nor will it obligate the Government for final acceptance.

### PART 2 PRODUCTS

#### 2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be portland cement, portland-pozzolan cement, or portland cement in combination with pozzolan or silica fume and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

##### 2.1.1 Portland Cement

ASTM C 150, Type I with a maximum 15 percent amount of tricalcium aluminate, or Type II. White portland cement shall meet the above requirements except that it may be Type I or Type II.

##### 2.1.2 High-Early-Strength Portland Cement

ASTM C 150, Type III with tricalcium aluminate limited to 8 percent, low alkali. Type III cement shall be used only in isolated instances and only when approved in writing.

##### 2.1.3 Pozzolan (Fly Ash)

ASTM C 618, Class C or F with the optional requirements for multiple

factor, drying shrinkage, and uniformity from Table 2A of ASTM C 618. Requirement for maximum alkalis from Table 1A of ASTM C 618 shall apply. If pozzolan is used, it shall never be less than 15 percent nor more than 35 percent by weight of the total cementitious material.

## 2.2 AGGREGATES

Aggregates shall conform to the following.

### 2.2.1 Fine Aggregate

Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

### 2.2.2 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33, Class 5S, size designation 1-1/2 inches to No. 4.

## 2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

### 2.3.1 Air-Entraining Admixture

ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

### 2.3.2 Accelerating Admixture

ASTM C 494, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

### 2.3.3 Water-Reducing or Retarding Admixture

ASTM C 494, Type A, B, or D, except that the 6-month and 1-year compressive and flexural strength tests are waived.

### 2.3.4 High-Range Water Reducer

ASTM C 494, Type F or G, except that the 6-month and 1-year strength requirements are waived. The admixture shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

### 2.3.5 Surface Retarder

COE CRD-C 94.

### 2.3.6 Expanding Admixture

Aluminum powder type expanding admixture conforming to ASTM C 937.

### 2.3.7 Other Chemical Admixtures

Chemical admixtures for use in producing flowing concrete shall comply with

ASTM C 1017, Type I or II. These admixtures shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

## 2.4 CURING MATERIALS

### 2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

### 2.4.2 Membrane-Forming Compound

Membrane-Forming curing compound shall conform to ASTM C 309, Type 1-D or 2, except that only a styrene acrylate or chlorinated rubber compound meeting Class B requirements shall be used for surfaces that are to be painted or are to receive bituminous roofing, or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified. Nonpigmented compound shall contain a fugitive dye, and shall have the reflective requirements in ASTM C 309 waived.

### 2.4.3 Burlap and Cotton Mat

Burlap and cotton mat used for curing shall conform to AASHTO M 182.

## 2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

## 2.6 NONSHRINK GROUT

Nonshrink grout shall conform to ASTM C 1107, Grade A, and shall be a commercial formulation suitable for the proposed application.

## 2.7 NONSLIP SURFACING MATERIAL

Nonslip surfacing material shall consist of 55 percent, minimum, aluminum oxide or silicon-dioxide abrasive ceramically bonded together to form a homogeneous material sufficiently porous to provide a good bond with portland cement paste; or factory-graded emery aggregate consisting of not less than 45 percent aluminum oxide and 25 percent ferric oxide. The aggregate shall be well graded from particles retained on the No. 30 sieve to particles passing the No. 8 sieve.

## 2.8 LATEX BONDING AGENT

Latex agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

## 2.9 EPOXY RESIN

Epoxy resins for use in repairs shall conform to ASTM C 881, Type V, Grade 2. Class as appropriate to the existing ambient and surface temperatures.

## 2.10 EMBEDDED ITEMS

Embedded items shall be of the size and type indicated or as needed for the application. Dovetail slots shall be galvanized steel. Inserts for shelf angles and bolt hangers shall be of malleable iron or cast or wrought steel.

## 2.11 JOINT MATERIALS

### 2.11.1 Joint Fillers, Sealers, and Waterstops

Expansion joint fillers shall be preformed materials conforming to ASTM D 1751 or ASTM D 1752. Materials for waterstops shall be in accordance with Section 03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS. Materials for and sealing of joints shall conform to the requirements of Section 07900 JOINT SEALING.

### 2.11.2 Contraction Joints in Slabs

Sawable type contraction joint inserts shall conform to COE CRD-C 540. Nonsawable joint inserts shall have sufficient stiffness to permit placement in plastic concrete without undue deviation from a straight line and shall conform to the physical requirements of COE CRD-C 540, with the exception of Section 3.4 "Resistance to Sawing". Plastic inserts shall be polyvinyl chloride conforming to the materials requirements of COE CRD-C 572.

## 2.12 FLOWABLE CEMENTITIOUS FILL / CONTROLLED DENSITY FILL (CDF)

Controlled low strength and density fill shall have air content up to 35 percent and 28-day compressive strength between 60 and 200 psi.

## PART 3 EXECUTION

### 3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03100 STRUCTURAL CONCRETE FORMWORK. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200 CONCRETE REINFORCEMENT. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

#### 3.1.1 Foundations

##### 3.1.1.1 Concrete on Earth Foundations

Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly

compacted.

### 3.1.2 Previously Placed Concrete

Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next horizontal lift by cleaning the construction joint surface with either air-water cutting, sandblasting, high-pressure water jet, or other approved method. Concrete at the side of vertical construction joints shall be prepared as approved by the Contracting Officer. Air-water cutting shall not be used on formed surfaces or surfaces congested with reinforcing steel. Regardless of the method used, the resulting surfaces shall be free from all laitance and inferior concrete so that clean surfaces of well bonded coarse aggregate are exposed and make up at least 10-percent of the surface area, distributed uniformly throughout the surface. The edges of the coarse aggregate shall not be undercut. The surface of horizontal construction joints shall be kept continuously wet for the first 12 hours during the 24-hour period prior to placing fresh concrete. The surface shall be washed completely clean as the last operation prior to placing the next lift. For heavy duty floors and two-course floors a thin coat of neat cement grout of about the consistency of thick cream shall be thoroughly scrubbed into the existing surface immediately ahead of the topping placing. The grout shall be a 1:1 mixture of portland cement and sand passing the No. 8 sieve. The topping concrete shall be deposited before the grout coat has had time to stiffen.

#### 3.1.2.1 Air-Water Cutting

Air-water cutting of a fresh concrete surface shall be performed at the proper time and only on horizontal construction joints. The air pressure used in the jet shall be 100 psi plus or minus, 10 psi, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. When approved by the Contracting Officer, a surface retarder complying with the requirements of COE CRD-C 94 may be applied to the surface of the lift in order to prolong the period of time during which air-water cutting is effective. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water. Where necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material, high-pressure waterjet or sandblasting shall be used as the last operation before placing the next lift.

#### 3.1.2.2 High-Pressure Water Jet

A stream of water under a pressure of not less than 3,000 psi shall be used for cutting and cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse-aggregate particles. If the waterjet is incapable of a satisfactory cleaning, the surface shall be cleaned by sandblasting.

#### 3.1.2.3 Wet Sandblasting

Wet sandblasting shall be used after the concrete has reached sufficient strength to prevent undercutting of the coarse aggregate particles. After wet sandblasting, the surface of the concrete shall then be washed thoroughly to remove all loose materials.

#### 3.1.2.4 Waste Disposal

The method used in disposing of waste water employed in cutting, washing, and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. The method of disposal shall be subject to approval.

### 3.1.3 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Conduit and other embedded items shall be clean and free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding shall not be performed on embedded metals within 1 foot of the surface of the concrete. Tack welding shall not be performed on or to embedded items.

## 3.2 CONCRETE PRODUCTION

### 3.2.1 Batching, Mixing, and Transporting Concrete

Concrete shall either be batched and mixed onsite or shall be furnished from a ready-mixed concrete plant. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94, except as otherwise specified. Truck mixers, agitators, and nonagitating transporting units shall comply with NRMCA TMMB 100. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch tickets shall be furnished for each load of ready-mixed concrete. Site-mixed concrete shall conform to the following subparagraphs.

#### 3.2.1.1 General

The batching plant shall be located off site close to the project. The batching, mixing and placing system shall have a capacity of at least 100 cubic yards per hour. The batching plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.

## 3.3 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the placing site in truck mixers or by approved pumping equipment.

## 3.4 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer or transporting unit to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

### 3.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet. The maximum dimension of the

gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 2 cubic yards shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

#### 3.4.2 Transfer Hoppers

Concrete may be charged into nonagitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and shall have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitating transfer hoppers more than 30 minutes.

#### 3.4.3 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Nonagitating equipment shall be used only for transporting plant-mixed concrete over a smooth road and when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

#### 3.4.4 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

#### 3.4.5 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means, such as discharge baffle or hopper, for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 36 inches. The belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant truck that is long enough to extend through the reinforcing bars.

#### 3.4.6 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.



### 3.5 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

#### 3.5.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns and walls until concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

#### 3.5.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.025 inch, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall

not be used to move concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segregation or flotation of coarse aggregate shall be prevented.

Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

### 3.5.3 Cold Weather Requirements

Special protection measures, approved by the Contracting Officer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, an accelerating admixture conforming to ASTM C 494, Type C or E may be used, provided it contains no calcium chloride. Calcium chloride shall not be used.

### 3.5.4 Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064/C 1064M. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature

| Relative Humidity, Percent,<br>During Time of<br>Concrete Placement | Maximum Allowable Concrete<br>Temperature<br>Degrees |
|---|--|
| Greater than 60   | 90 F   |
| 40-60   | 85 F   |
| Less than 40  | 80 F   |

### 3.5.5 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, as well as interior placements when space heaters produce low humidity, the Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated

by use of Fig. 2.1.5 of ACI 305R. In addition the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

### 3.6 JOINTS

Joints shall be located and constructed as indicated or approved. Joints not indicated on the drawings shall be located and constructed to minimize the impact on the strength of the structure. Joints shall be perpendicular to the main reinforcement. All reinforcement shall be continued across joints; except that reinforcement or other fixed metal items shall not be continuous through expansion joints, or through construction or contraction joints in slabs on grade. Reinforcement shall be 2 inches clear from each joint. Except where otherwise indicated, construction joints between interior slabs on grade and vertical surfaces shall consist of 30 pound asphalt-saturated felt, extending for the full depth of the slab. The perimeters of the slabs shall be free of fins, rough edges, spalling, or other unsightly appearance. Reservoir for sealant for construction and contraction joints in slabs shall be formed to the dimensions shown on the drawings by removing snap-out joint-forming inserts, by sawing sawable inserts, or by sawing to widen the top portion of sawed joints. Joints to be sealed shall be cleaned and sealed as indicated and in accordance with Section 07900 JOINT SEALING.

#### 3.6.1 Construction Joints

For concrete other than slabs on grade, construction joints shall be located so that the unit of operation does not exceed 50 feet. Concrete shall be placed continuously so that each unit is monolithic in construction. Fresh concrete shall not be placed against adjacent hardened concrete until it is at least 24 hours old. Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete columns, walls, or piers shall be in place at least 2 hours, or until the concrete begins to lose its plasticity, before placing concrete for beams, girders, or slabs thereon. In walls having door or window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to conform to structural requirements or architectural details. Where horizontal construction joints in walls or columns are required, a strip of 1 inch square-edge lumber, bevelled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 1 inch above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph Previously Placed Concrete.

#### 3.6.2 Contraction Joints in Slabs on Grade

Contraction joints shall be located and detailed as shown on the drawings. Contraction Joints shall be produced by forming a weakened plane in the

concrete slab by use of rigid inserts impressed in the concrete during placing operations use of snap-out plastic joint forming inserts or sawing a continuous slot with a concrete saw. Regardless of method used to produce the weakened plane, it shall be 1/4 the depth of the slab thickness and between 1/8 and 3/16 inch wide. For saw-cut joints, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent raveling of the edges of the saw cut. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. Reservoir for joint sealant shall be formed as previously specified.

### 3.6.3 Expansion Joints

Installation of expansion joints and sealing of these joints shall conform to the requirements of Section 03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS.

### 3.6.4 Waterstops

Waterstops shall be installed in conformance with the locations and details shown on the drawings using materials and procedures specified in Section 03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS.

### 3.6.5 Dowels and Tie Bars

Dowels and tie bars shall be installed at the locations shown on the drawings and to the details shown, using materials and procedures specified in Section 03200 CONCRETE REINFORCEMENT and herein. Conventional smooth "paving" dowels shall be installed in slabs using approved methods to hold the dowel in place during concreting within a maximum alignment tolerance of 1/8 inch in 12 inches. "Structural" type deformed bar dowels, or tie bars, shall be installed to meet the specified tolerances. Care shall be taken during placing adjacent to and around dowels and tie bars to ensure there is no displacement of the dowel or tie bar and that the concrete completely embeds the dowel or tie bar and is thoroughly consolidated.

## 3.7 FINISHING FORMED SURFACES

Forms, form materials, and form construction are specified in Section 03100 STRUCTURAL CONCRETE FORMWORK. Finishing of formed surfaces shall be as specified herein and in Section 03360 SIMULATED STONE MASONRY. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A or B finish. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend

of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or drummy areas at the completion of the contract and, for Class A and B Finishes, shall be inconspicuous. Repairs not meeting these requirements will be rejected and shall be replaced.

### 3.7.1 Class A Finish and Class B Finish

Class A finish is not required anywhere. Class B finish is required in the interior walls of the pumphouse superstructure and the access to the discharge chamber. Fins, ravelings, and loose material shall be removed, all surface defects over 1/2 inch in diameter or more than 1/2 inch deep, shall be repaired and, except as otherwise indicated or as specified in Section 03100 STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and filled. Defects more than 1/2 inch in diameter shall be cut back to sound concrete, but in all cases at least 1 inch deep.

The Contractor shall prepare a sample panel for approval (as specified in PART 1) before commencing repair, showing that the surface texture and color match will be attained. Metal tools shall not be used to finish repairs in Class A surfaces.

### 3.7.2 Class C and Class D Finish

Class C finish is required for the interior walls of the pumphouse substructure and discharge chamber. Class D finish is not required. Fins, ravelings, and loose material shall be removed, and, except as otherwise indicated or as specified in Section 03100 STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and filled. Honeycomb and other defects more than 1/2 inch deep or more than 2 inches in diameter shall be repaired. Defects more than 2 inches in diameter shall be cut back to sound concrete, but in all cases at least 1 inch deep.

### 3.7.3 Architectural and Special Finishes

Architectural concrete finishes are specified in Section 03360 SIMULATED STONE MASONRY. Special finishes shall conform to the requirements specified herein.

## 3.8 REPAIRS

### 3.8.1 Damp-Pack Mortar Repair

Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter but not over 4 inches shall be repaired by the damp-pack mortar method. Form tie holes shall be reamed and other similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1 part portland cement to 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water. Only sufficient water shall be used to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use. Mortar shall be thoroughly tamped in place in thin layers using a hammer and hardwood block. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the

outside face. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

### 3.8.2 Repair of Major Defects

Major defects will be considered to be those more than 1/2 inch deep or, for Class A and B finishes, more than 1/2 inch in diameter and, for Class C and D finishes, more than 2 inches in diameter. Also included are any defects of any kind whose depth is over 4 inches or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

#### 3.8.2.1 Surface Application of Mortar Repair

Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 2 inches on all sides. All such defective areas greater than 12 square inches shall be outlined by saw cuts at least 1 inch deep. Defective areas less than 12 square inches shall be outlined by a 1 inch deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Contracting Officer's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a mortar gun is used, the gun shall be a small compressed air-operated gun to which the mortar is slowly hand fed and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

#### 3.8.2.2 Repair of Deep and Large Defects

Deep and large defects will be those that are more than 6 inches deep and also have an average diameter at the surface more than 18 inches or that are otherwise so identified by the Project Office. Such defects shall be repaired as specified herein or directed, except that defects which affect the strength of the structure shall not be repaired and that portion of the

structure shall be completely removed and replaced. Deep and large defects shall be repaired by procedures approved in advance including forming and placing special concrete using applied pressure during hardening. Preparation of the repair area shall be as specified for surface application of mortar. In addition, the top edge (surface) of the repair area shall be sloped at approximately 20 degrees from the horizontal, upward toward the side from which concrete will be placed. The special concrete shall be a concrete mixture with low water content and low slump, and shall be allowed to age 30 to 60 minutes before use. Concrete containing a specified expanding admixture may be used in lieu of the above mixture; the paste portion of such concrete mixture shall be designed to have an expansion between 2.0 and 4.0 percent when tested in accordance with ASTM C 940. A full width "chimney" shall be provided at the top of the form on the placing side to ensure filling to the top of the opening. A pressure cap shall be used on the concrete in the chimney with simultaneous tightening and revibrating the form during hardening to ensure a tight fit for the repair. The form shall be removed after 24 hours and immediately the chimney shall be carefully chipped away to avoid breaking concrete out of the repair; the surface of the repair concrete shall be dressed as required.

### 3.9 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, when tested as specified herein.

#### 3.9.1 General

The ambient temperature of spaces adjacent to unformed surfaces being finished and of the base on which concrete will be placed shall be not less than 50 degrees F. In hot weather all requirements of paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking shall be met. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Unless otherwise shown on the drawings, exterior surfaces shall be sloped for drainage, as directed. Where drains are provided, interior floors shall be evenly sloped to the drains. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or "jitterbugs" shall not be used for any surfaces. The dusting of surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any slabs with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

#### 3.9.2 Rough Slab Finish

As a first finishing operation for unformed surfaces and as final finish for slabs to receive mortar setting beds, the surface shall receive a rough

slab finish prepared as follows. Unless specified otherwise, unformed surfaces shall receive only a rough slab finish. The concrete shall be uniformly placed across the slab area, consolidated as previously specified, and then screeded with straightedge strikeoffs immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible. Side forms and screed rails shall be provided, rigidly supported, and set to exact line and grade. Allowable tolerances for finished surfaces apply only to the hardened concrete, not to forms or screed rails. Forms and screed rails shall be set true to line and grade. "Wet screeds" shall not be used.

### 3.9.3 Troweled Finish

The pumphouse superstructure floor including the garage area shall be given a trowel finish. After floating is complete and after the surface moisture has disappeared, unformed surfaces shall be steel-troweled to a smooth, even, dense finish, free from blemishes including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. Additional trowelings shall be performed, either by hand or machine until the surface has been troweled 2 3 4 times, with waiting period between each. Care shall be taken to prevent blistering and if such occurs, troweling shall immediately be stopped and operations and surfaces corrected. A final hard steel troweling shall be done by hand, with the trowel tipped, and using hard pressure, when the surface is at a point that the trowel will produce a ringing sound. The finished surface shall be thoroughly consolidated and shall be essentially free of trowel marks and be uniform in texture and appearance. The concrete mixture used for troweled finished areas shall be adjusted, if necessary, in order to provide sufficient fines (cementitious material and fine sand) to finish properly.

### 3.9.4 Non-Slip Finish

Non-slip floors shall be constructed in accordance with the following subparagraphs.

#### 3.9.4.1 Broomed

Exposed floor areas around the trash rack access and the pumphouse foundation slab shall be given a broomed finish. After floating, the surface shall be lightly steel troweled, and then carefully scored by pulling a coarse fiber push-type broom across the surface. Brooming shall be transverse to traffic or at right angles to the slope of the slab. After the end of the curing period, the surface shall be vigorously broomed with a coarse fiber broom to remove all loose or semi-detached particles.

### 3.10 CURING AND PROTECTION

#### 3.10.1 General

Concrete shall be cured by an approved method for the period of time given below:

|                               |        |
|-------------------------------|--------|
| Concrete with Type III cement | 3 days |
| All other concrete            | 7 days |

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the



curing period. Air and forms in contact with concrete shall be maintained at a temperature above 50 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure, and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. Materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat, including welding, shall be permitted near or in direct contact with the concrete at any time. Except as otherwise permitted by paragraph Membrane Forming Curing Compounds, moist curing shall be provided for any areas to receive floor hardener, any paint or other applied coating, or to which other concrete is to be bonded.

Concrete containing silica fume shall be initially cured by fog misting during finishing, followed immediately by continuous moist curing. Except for plastic coated burlap, impervious sheeting alone shall not be used for curing.

### 3.10.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. If water or curing materials used stain or discolor concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned as approved. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, nonsupporting vertical forms shall be broken loose from the concrete soon after the concrete hardens and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day.

### 3.10.3 Membrane Forming Curing Compounds

Membrane forming curing compounds shall not be used on surfaces in the pumphouse operating floor. Otherwise, concrete may be cured with a pigmented curing compound in lieu of moist curing. Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete, including surfaces to which a smooth finish is to be applied or other concrete to be bonded. However, a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements, may be used for surfaces which are to be painted or are to receive bituminous roofing or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing or flooring specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. All surfaces shall be thoroughly moistened with water. Curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the

curing period. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 75 psi, at a uniform coverage of not more than 400 square feet per gallon for each coat, and the second coat shall be applied perpendicular to the first coat. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. Surfaces on which clear compound is used shall be shaded from direct rays of the sun for the first 3 days. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

#### 3.10.4 Impervious Sheeting

The following concrete surfaces may be cured using impervious sheets: all horizontal surfaces except the pumphouse operating floor. However, except for plastic coated burlap, impervious sheeting alone shall not be used for curing. Impervious-sheet curing shall only be used on horizontal or nearly horizontal surfaces. Surfaces shall be thoroughly wetted and be completely covered with the sheeting. Sheeting shall be at least 18 inches wider than the concrete surface to be covered. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 12 inches and securely weighted down or shall be lapped not less than 4 inches and taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

#### 3.10.5 Cold Weather Curing and Protection

When the daily ambient low temperature is less than 32 degrees F the temperature of the concrete shall be maintained above 40 degrees F for the first seven days after placing. During the period of protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by suitable temperature measuring devices furnished by the Governmentthe Contractor, as required, and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor as directed.

### 3.11 SETTING BASE PLATES AND BEARING PLATES

After being properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be set to the proper line and elevation with damp-pack bedding mortar, except where nonshrink grout is indicated. The thickness of the mortar or grout shall be approximately 1/24 the width of the plate, but not less than 3/4 inch. Concrete and metal surfaces in contact with grout shall be clean and free of oil and grease, and concrete surfaces in contact with grout shall be damp and free of laitance when grout is placed. Nonshrink grout shall be used for pumps and generator equipment.

#### 3.11.1 Damp-Pack Bedding Mortar

Damp-pack bedding mortar shall consist of 1 part cement and 2-1/2 parts fine aggregate having water content such that a mass of mortar tightly

squeezed in the hand will retain its shape but will crumble when disturbed.

The space between the top of the concrete and bottom of the bearing plate or base shall be packed with the bedding mortar by tamping or ramming with a bar or rod until it is completely filled.

### 3.11.2 Nonshrink Grout

Nonshrink grout shall be a ready-mixed material requiring only the addition of water. Water content shall be the minimum that will provide a flowable mixture and completely fill the space to be grouted without segregation, bleeding, or reduction of strength.

#### 3.11.2.1 Mixing and Placing of Nonshrink Grout

Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified therein. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. The space between the top of the concrete or machinery-bearing surface and the plate shall be filled solid with the grout. Forms shall be of wood or other equally suitable material for completely retaining the grout on all sides and on top and shall be removed after the grout has set. The placed grout shall be carefully worked by rodding or other means to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be retempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be under pressure with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 65 to 85 degrees F until after setting.

#### 3.11.2.2 Treatment of Exposed Surfaces

For metal-oxidizing nonshrink grout, exposed surfaces shall be cut back 1 inch and immediately covered with a parge coat of mortar consisting of 1 part portland cement and 2-1/2 parts fine aggregate by weight, with sufficient water to make a plastic mixture. The parge coat shall have a smooth finish. For other mortars or grouts, exposed surfaces shall have a smooth-dense finish and be left untreated. Curing shall comply with paragraph CURING AND PROTECTION.

### 3.12 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and shall submit specified reports. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease and the operation shall be corrected. The laboratory performing the tests shall be onsite and shall conform with ASTM C 1077. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and as it deems necessary thereafter for conformance with ASTM C 1077.

#### 3.12.1 Grading and Corrective Action

##### 3.12.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately be reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

#### 3.12.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control.

However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

#### 3.12.2 Quality of Aggregates

Thirty days prior to the start of concrete placement, the Contractor shall perform all tests for aggregate quality required by ASTM C 33. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every three months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

#### 3.12.3 Scales, Batching and Recording

The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every three months. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. At the same time, the Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

#### 3.12.4 Batch-Plant Control

The measurement of concrete materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during each day's plant operation.

#### 3.12.5 Concrete Mixture

- a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231 for normal weight concrete and ASTM C 173 for lightweight concrete. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph Air Entrainment. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the air content at the mixer controlled as directed.
- b. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment,

another test shall be made to verify the result of the adjustment.

Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted.

- c. Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump for each type of mixture. The upper warning limit shall be set at 1/2 inch below the maximum allowable slump specified in paragraph Slump in PART 1 for each type of concrete and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer. However, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the slump at the mixer controlled as directed.
- d. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an adjustment shall immediately be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c ratio specified, based on aggregates which are in a saturated surface dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted, and the Contractor shall

take appropriate steps to bring the slump under control. Additional slump tests shall be made as directed.

- e. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064/C 1064M. The temperature shall be reported along with the compressive strength data.
- f. Strength Specimens. At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 500 cubic yards or portion thereof of that concrete mixture placed each day. Additional sets of test specimens shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A truly random (not haphazard) sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph Strength Requirements in PART 1 shall consist of four specimens, two to be tested at 7 days and two at 28 days. A set of test specimens for concrete with a 90-day strength per the same paragraph shall consist of six specimens, two tested at 7 days, two at 28 days, and two at 90 days. Test specimens shall be molded and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39 for test cylinders and ASTM C 78 for test beams. Results of all strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength "tests", ("test" as defined in paragraph Strength Requirements in PART 1) moving average of last 3 "tests" for strength, and moving average for range for the last 3 "tests" for each mixture. The charts shall be similar to those found in ACI 214.3R.

#### 3.12.6 Inspection Before Placing

Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

#### 3.12.7 Placing

The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Contracting Officer, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

#### 3.12.8 Vibrators

The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing. Any vibrator not meeting the requirements of paragraph Consolidation, shall be immediately removed from service and repaired or replaced.

#### 3.12.9 Curing Inspection

- a. Moist Curing Inspections. At least once each shift, and not less than twice per day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
- b. Moist Curing Corrective Action. When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by 1 day.
- c. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the Contractor shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered, shall compute the rate of coverage in square feet per gallon, and shall note whether or not coverage is uniform.
- d. Membrane Curing Corrective Action. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.
- e. Sheet Curing Inspection. At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.
- f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

#### 3.12.10 Cold-Weather Protection

At least once each shift and once per day on non-work days, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

#### 3.12.11 Mixer Uniformity



- a. Stationary Mixers. Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the shortest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94.
- b. Truck Mixers. Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.
- c. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

#### 3.12.12 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all contractor quality control records.

#### 3.13 FLOWABLE CEMENTITIOUS FILL

The Contractor shall prepare and install fill in strict accordance with manufacturer's instructions. Water content of mix should be adjusted to obtain maximum 3 inches initial slump prior to incorporating admixture. Contractor shall perform trial mixtures as recommended by manufacturer in order to obtain final mix meeting compressive strength and air content percent required. Place fill continuously until the designated work section is filled.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 03 - CONCRETE

SECTION 03360

SIMULATED STONE MASONRY

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DESIGN REQUIREMENTS
- 1.4 QUALITY ASSURANCE
- 1.5 PROJECT CONDITIONS
- 1.6 SEQUENCING

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Simulated Stone Masonry Molds
  - 2.1.2 Release Agent
  - 2.1.3 Form Ties
  - 2.1.4 Mortar Joints
  - 2.1.5 Color Stain

PART 3 EXECUTION

- 3.1 ACCEPTABLE INSTALLERS
  - 3.1.1 Formed Concrete Construction
  - 3.1.2 Color Stain System Application
- 3.2 CONSTRUCTION
- 3.3 SPECIAL TECHNIQUES
  - 3.3.1 Forming Textured Concrete
  - 3.3.2 Applying Color Stain System
- 3.4 PROTECTION

-- End of Section Table of Contents --

SECTION 03360

SIMULATED STONE MASONRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |   |
|-------------|---|
| ASTM D 1308 | (1987; R 1998) Effect of Household Chemicals on Clear and Pigmented Organic Finishes                                    |
| ASTM D 3359 | (1997) Measuring Adhesion by Tape Test  |
| ASTM G 23   | (1996) Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Material |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Simulated Stone Masonry; GA

Plan, elevation and details to show overall pattern, joint locations, form tie locations, and end, edge and other special conditions.

SD-14 Samples

Panel; FIO

Within 30 days of receiving the general contract General Contractor is required to submit a 24 inch x 24 inch sample of each the simulated stone masonry finishes. Sample is to demonstrate the finish described in paragraph DESIGN REQUIREMENTS. Approval of sample panel is required by Architect/Engineer and Owner.

Form Ties; FIO

Form ties, sample and description, showing method of separation when forms are removed.

1.3 DESIGN REQUIREMENTS

Design and pattern of the concrete surface shall follow the manufacturer's standard drawing. If an actual stone surface or stone wall to be matched is available, the completed colored and formed concrete surface shall match the natural material as closely as possible. See Section 04200 MASONRY for stone type. Patterning of simulated stone masonry shall appear natural and non-repeating. Seam lines or match lines caused from two of more molds coming together will not be apparent when viewing final wall. Final coloration of cast stone concrete surface shall accurately simulate the appearance of real stone including the multiple colors, shades, flecking, and veining that is apparent in real stone. It shall also demonstrate the colors that may be apparent from aging, such as staining from oxidation, rusting and/or organic staining from soil and/or vegetation. Note that in paragraph SUBMITTAL and Part 3, EXECUTION, a sample and mockup are required. Upon approval by Architect/Engineer and Owner, mockup shall serve as quality standard for the project.

#### 1.4 QUALITY ASSURANCE

Manufacturer of simulated stone masonry molds and custom coloring system shall have 5 years experience making stone masonry molds and color stains to create formed concrete surfaces to match natural stone shapes, surface textures and colors.

Pre-installation meeting: Schedule conference with manufacturer representative to ensure understanding of simulated stone masonry molds use, color application, requirements for construction of mockup, and to coordinate the work.

#### 1.5 PROJECT CONDITIONS

Environmental requirements: Apply color stain when ambient temperatures are between 50 and 100 degrees F. Consult manufacturer if conditions differ from this requirement.

#### 1.6 SEQUENCING

Schedule color stain application with earthwork and backfilling of any wall areas making sure that all simulated stone texture is colored to the minimum distance below grade. Delay adjacent plantings until color application is completed. Coordinate work to permit coloring applications without interference from other trades.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

##### 2.1.1 Simulated Stone Masonry Molds

Reusable, made of high-strength urethane, easily attachable to forms. Molds shall not compress more than 1/4 inch when concrete is poured at rate of 10 vertical feet per hour. Molds shall be removable without causing deterioration of surface or underlying concrete.

- a. Reach One Floodwall form liner: Custom Rock Form Liner #11016-Rough Cut Stone, #12008 - Mankato Cut Stone, #12005 - Bearpath Stone, and simulated brick, as manufactured by Custom Rock International, Scott System, Inc. or approved equal.

b. Reach One Planter Wall form liner: Custom Rock Form Liner #12005 - Bearpath Stone, as manufactured by Custom Rock International, Scott System, Inc. or approved equal.

c. Reach Two Floodwall form liner: Custom Rock Form Liner #11016-Rough Cut Stone, #12006 - New England Drystack, and Cut Limestone Pattern, as manufactured by Custom Rock International, Scott System, Inc. or approved equal.

d. Reach Three Closure form liner: Custom Rock Form Liner #11016-Rough Cut Stone, #12006 - New England Drystack, and Cut Limestone Pattern, as manufactured by Custom Rock International, Scott System, Inc. or approved equal.

e. Reach Four Floodwalls form liner: Custom Rock Form Liner #11016-Rough Cut Stone, #12005 - Bearpath Stone as manufactured by Custom Rock International, Scott System, Inc. or approved equal.

#### 2.1.2 Release Agent

Compatible with simulated stone masonry molds and with color stain system to be applied to surface. Consult manufacturer.

#### 2.1.3 Form Ties

Form ties shall be made of either metal or fiberglass. Using metal ties which result in a portion of the tie permanently embedded in the concrete shall be designed to separate at least 1 inch back from finished surface, leaving only a neat hole that can be plugged with patching material. Contractor shall submit the type of form ties to the Engineer, project designer or Owner for approval prior to use in this work.

#### 2.1.4 Mortar Joints

Joints shall be colored to simulate real mortar.

#### 2.1.5 Color Stain

CRI pigmented stain is a special penetrating stain mix, as provided by manufacturer, and shall achieve color variations present in the natural stone being simulated for this project, as required by Architect/Engineer and Owner as referenced in paragraph DESIGN REQUIREMENTS. Stain shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali, fungi, sunlight or weathering. Stain mix shall be a water borne, low V.O.C. material, less than 289 grams/liter, and shall meet requirements for weathering resistance of 2000 hours accelerated exposure measured by weather-o-meter in accordance with ASTM G 23. Scrub test 1000 revolutions. Abrasive resistance (Tabor-CF-10) 500 cycles. Adhesion ASTM D 3359 1.00MM cross cuts on glass pass 3 or higher on a scale of 1 to 5. Supply information pertaining to chemical resistance ASTM D 1308 to 87.

### PART 3 EXECUTION

#### 3.1 ACCEPTABLE INSTALLERS

##### 3.1.1 Formed Concrete Construction

Five years experience pouring vertically formed architectural concrete.

Installer shall be trained in manufacturer's special techniques in order to achieve realistic surfaces.

### 3.1.2 Color Stain System Application

Manufacturer or manufacturer's authorized representative.

## 3.2 CONSTRUCTION

Mockup: Build on site sixty days before work starts, using same materials, methods and work force that will be used for the project.

Architect/Engineer and Owner will determine specific requirements and location, and whether mockup shall be incorporated into the project.

1. Size: 50 square feet, or larger if needed to adequately illustrate the pattern and texture selected.

2. Include an area to demonstrate wall mold butt joint and if appropriate, continuation of pattern through expansion joint.

3. If design includes stone texture across top of wall, include in mockup.

4. After concrete work on mockup is completed and cured for a minimum of 28 days, and after surface is determined to be acceptable for coloring, apply color stain system.

5. After coloring is determined to be acceptable by the Architect/Engineer and Owner, construction of project may proceed, using mockup as quality standard.

## 3.3 SPECIAL TECHNIQUES

### 3.3.1 Forming Textured Concrete

For preparation, clean simulated stone masonry molds and make free of buildup prior to each pour. Inspect for blemishes or tears. Repair if needed following manufacturer's recommendations. Place stone molds with less than 1/4 inch separation between them. Attach molds to form securely following manufacturer's recommendations. Apply form release agent following manufacturers' recommendations. Form stripping and related construction shall avoid creating defects in finished surface. If the pattern selected has molds connecting through the middle of the stones, carefully remove the seam line created by abutting molds. Match the texture and shape of the surrounding stone, avoiding visible seams or mold marks. Place form ties at thinnest points of molds (high points of finished wall). Neatly patch the hole remaining after disengaging the protruding portion of the tie so that it will not be visible after coloring the concrete surface.

Where an expansion joint must occur at a point other than at mortar or rustication joints, such as at the face of concrete texture which is to have the appearance of stone, consult manufacturer for proper treatment of expansion material.

### 3.3.2 Applying Color Stain System

All simulated stone surfaces that are to be stained and any patching that has been done in these areas shall be at least 30 days old. Clean surface prior to application of stain materials to assure that surface is free of latency, dirt, dust, grease, efflorescence, paint, or other foreign

material, following manufacturer's instructions for surface preparation. Do not sandblast. Preferred method to remove latency is pressure washing with water, minimum 3000 psi (a rate of 3 to 4 gallons per minute), using fan nozzle perpendicular to and at a distance of 1 or 2 feet from surface. Completed surface shall be free of blemishes, discoloration, surface voids and unnatural form marks.

#### 3.4 PROTECTION

Where exposed soil or pavement is adjacent which may spatter dirt or soil from rainfall, or where surface may be subject to over spray from other processes, provide temporary cover of completed work.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 03 - CONCRETE

SECTION 03413

PRECAST ARCHITECTURAL CONCRETE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL REQUIREMENTS
- 1.3 SUBMITTALS
- 1.4 DESIGN
  - 1.4.1 Standards and Loads
  - 1.4.2 Connections
  - 1.4.3 Concrete Strength
  - 1.4.4 Concrete Proportion
  - 1.4.5 Calculations
- 1.5 STORAGE AND INSPECTION AT MANUFACTURER'S PLANT
- 1.6 HANDLING AND STORAGE

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Aggregates
  - 2.1.2 Reinforcing Steel
  - 2.1.3 Tie Wire
  - 2.1.4 Inserts
  - 2.1.5 Plates, Angles, Anchors and Embedments
  - 2.1.6 Form Release Agent
  - 2.1.7 Admixtures
- 2.2 PRECAST CONCRETE UNITS
  - 2.2.1 Formwork
  - 2.2.2 Reinforcement
  - 2.2.3 Embedded Accessories
  - 2.2.4 Stripping
  - 2.2.5 Identification
  - 2.2.6 Finishes
    - 2.2.6.1 Exposed Surfaces
    - 2.2.6.2 Other Surfaces

PART 3 EXECUTION

- 3.1 ERECTION
- 3.2 JOINT SEALING
- 3.3 CLEANING
- 3.4 PROTECTION OF WORK
- 3.5 DEFECTIVE WORK

-- End of Section Table of Contents --



SECTION 03413

PRECAST ARCHITECTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

|              |  |
|--------------|--|
| ACI 211.1    | (1991) Selecting Proportions for Normal, Heavyweight, and Mass Concrete                |
| ACI 211.2    | (1998) Standard Practice for Selecting Proportions for Structural Lightweight Concrete |
| ACI SP-66    | (1994) ACI Detailing Manual: Section Details and Detailing of Concrete Reinforcement   |
| ACI 303      | (1974) Guide To Cast-In-Place Architectural Concrete Practice                          |
| ACI 318/318R | (1999) Building Code Requirements for Reinforced Concrete                              |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |  |
|-------------|--|
| ASTM C 494  | (1999) Chemical Admixtures for Concrete                          |
| ASTM C 1017 | (1998) Chemical Admixtures for Use in Producing Flowing Concrete |

AMERICAN WELDING SOCIETY (AWS)

|          |  |
|----------|--|
| AWS D1.1 | (2000) Structural Welding Code - Steel |
|----------|--|

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

|             |  |
|-------------|--|
| PCI MNL-117 | (1996) Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products |
| PCI MNL-122 | (1989) Architectural Precast Concrete  |

1.2 GENERAL REQUIREMENTS

Precast concrete units shall be designed and fabricated by an experienced and acceptable precast concrete manufacturer certified under the PCI Plant

Certification Program. The manufacturer shall have been regularly and continuously engaged in the manufacture of precast concrete work similar to that indicated on the drawings for at least 3 years. Precast work shall be coordinated with the work of other trades.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

##### Calculations; GA

Design calculations, prior to the manufacture of any precast architectural concrete units for the project.

##### Mix Design; GA

A statement giving the maximum nominal coarse aggregate size, the proportions of all ingredients and the type and amount of any admixtures that will be used in the manufacture of each strength and type of concrete, prior to commencing operations. The statement shall be accompanied by test results from an approved testing laboratory, certifying that the proportions selected will produce concrete of the properties required. No substitutions shall be made without additional tests to verify that the concrete properties are satisfactory.

##### Manufacturer's Qualifications; GA

A statement giving the qualifications of the precast concrete manufacturer and of the installers, prior to commencing operations.

#### SD-04 Drawings

##### Architectural Concrete System; GA

Detail drawings showing details in accordance with ACI SP-66 and ACI 318/318R, including installation details. Detail drawings shall indicate separate identification marks for each different precast unit, location of units in the work, elevations, fabrication details, welding details, reinforcement, connections, dimensions, interface with adjacent members, blocking points for units stored at the precast concrete plant or at the jobsite, lifting points and special handling instructions in sufficient detail to cover manufacture, handling, and erection.

#### SD-09 Reports

##### Materials; GA

Certified copies of test reports including all test data and all test results. Tests for compressive strength of concrete shall be performed by an approved independent commercial testing laboratory, except that compressive strength tests for initial prestress may be performed in the manufacturer's plant laboratory.

#### SD-14 Samples

##### Precast Concrete Units; GA

Two 12 by 12 by 2 inch samples of each type of precast unit finish required for the project. Samples shall show matrix color, surface color, surface texture, and panel back finish.

#### 1.4 DESIGN

##### 1.4.1 Standards and Loads

Precast unit design shall conform to ACI 318/318R and PCI MNL-122. Design loads for precast concrete shall be as indicated on the drawings. A differential temperature of 160 degrees F, between interior and exterior faces of the units, shall be considered in the design. Stresses due to restrained volume change caused by shrinkage and temperature differential, handling, transportation and erection shall be accounted for in the design.

##### 1.4.2 Connections

Connection of units to other members, or to other units shall be of the type and configuration indicated. The design and sizing of connections for all design loads shall be by the Contractor.

##### 1.4.3 Concrete Strength

Precast concrete units shall have a 28-day compressive strength of 5000 psi.

##### 1.4.4 Concrete Proportion

Selection of proportions for concrete shall be based on the methodology presented in ACI 211.1 for normal weight concrete and ACI 211.2 for lightweight concrete. The concrete proportion shall be developed using the same type and brand of cement, the same type and gradation of aggregates, and the same type and brand of admixture that will be used in the manufacture of precast concrete units for the project. Calcium chloride shall not be used in precast concrete and admixtures containing chloride ions, nitrates, or other substances that are corrosive shall not be used in prestressed concrete.

##### 1.4.5 Calculations

Calculations for design of members and connections not shown shall be made by a professional engineer experienced in the design of precast architectural concrete. Calculation shall include the analysis of member for lifting stresses and the sizing of the lifting inserts.

#### 1.5 STORAGE AND INSPECTION AT MANUFACTURER'S PLANT

Precast units temporarily stored at the manufacturer's plant shall be protected from damage in accordance with PCI MNL-117. Immediately prior to shipment to the jobsite, all precast concrete units shall be inspected for quality to insure all precast units conform to the requirements specified. Inspection for quality shall include, but shall not necessarily be limited to, the following elements: color, texture, dimensional tolerances, chipping, cracking, staining, warping and honeycombing. All defective precast concrete units shall be replaced or repaired as approved.

## 1.6 HANDLING AND STORAGE

Precast units shall be delivered to the site in accordance with delivery schedule to avoid excessive build-up of units in storage at the site. Upon delivery to the jobsite all precast units shall be inspected for quality as specified above. If the precast units cannot be unloaded and placed directly into the work, they shall be stored onsite, off the ground and protected from weather, marring, or overload. Precast units shall be handled in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Except as otherwise specified, material shall conform to Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE and Section 03200 CONCRETE REINFORCEMENT.

#### 2.1.1 Aggregates

Aggregates shall be 3/4 inch.

#### 2.1.2 Reinforcing Steel

Reinforcing steel shall be galvanized if clearance to an exterior face is 1 inch or less.

#### 2.1.3 Tie Wire

Tie wire shall be soft monel or 18-8 stainless steel.

#### 2.1.4 Inserts

Inserts shall be manufacturer's standard, suited for the application.

#### 2.1.5 Plates, Angles, Anchors and Embedments

Material shall be as specified in PCI MNL-117. Steel items, other than stainless, shall be coated with a rust-inhibiting paint or shall be hot-dip galvanized. Steel items, including items embedded in concrete, shall be either stainless steel or hot dip galvanized steel.

#### 2.1.6 Form Release Agent

Release agent shall be manufacturer's standard nonstaining type.

#### 2.1.7 Admixtures

Admixtures shall conform to ASTM C 494. Plasticizing admixture, if used, shall conform to ASTM C 1017.

### 2.2 PRECAST CONCRETE UNITS

Precast concrete units shall be manufactured and cured in accordance with the applicable provisions of PCI MNL-117. Units shall be manufactured within the allowable tolerances given in PCI MNL-117.

#### 2.2.1 Formwork

Forms shall be steel of adequate thickness, braced, stiffened, anchored and aligned to produce precast architectural concrete units within required dimensional tolerances. Forms shall be sufficiently rigid to provide dimensional stability during handling and concrete placement and consolidation. Fiberglass-reinforced plastic, plastic coated wood, elastomeric or other nonabsorptive material shall be used for making tight joints and rustication pieces.

#### 2.2.2 Reinforcement

Fabrication and placement of reinforcement shall conform to the details shown on the approved detail drawings and PCI MNL-117.

#### 2.2.3 Embedded Accessories

Anchors, inserts, lifting devices, and other accessories which are to be embedded in the precast units shall be furnished and installed in accordance with the approved detail drawings. Embedded items shall be accurately positioned in their designed location, and shall have sufficient anchorage and embedment to satisfy design requirements.

#### 2.2.4 Stripping

Precast concrete units shall not be removed from forms until units develop sufficient strength to safely strip the formwork and to remove the precast concrete units from the forms to prevent damage to the units from overstress or chipping.

#### 2.2.5 Identification

Each precast concrete unit shall be marked to correspond to the identification marks for each different precast unit shown on the detail drawings.

#### 2.2.6 Finishes

##### 2.2.6.1 Exposed Surfaces

Surfaces of precast units exposed to view or surfaces indicated to be finished shall be finished with an acid etch finish - produced by treating the surface of unit with brushes which have been immersed in acid solution.

Surface sealers or coatings are generally not recommended. The designer should consult ACI 303 and PCI MNL-117 before specifying sealers or coatings.

##### 2.2.6.2 Other Surfaces

Surfaces of precast units not exposed to view or not otherwise indicated to be finished shall be finished in accordance with Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

### PART 3 EXECUTION

#### 3.1 ERECTION

Precast units shall be erected in accordance with the detail drawings and without damage to other units or to adjacent members. Units shall be set true to alignment and level, with joints properly spaced and aligned both vertically and horizontally. Erection tolerances shall be in accordance

with the requirements of PCI MNL-117 and PCI MNL-122. As units are being erected, shims and wedges shall be placed as required to maintain correct alignment. After final attachment, precast units shall be grouted as shown. After erection, welds and abraded surfaces of steel shall be cleaned and touched-up with a zinc-rich paint. Welds shall be made by a certified welder in accordance with the manufacturer's erection drawings. Pickup points, boxouts, inserts, and similar items shall be finished to match adjacent areas after erection. Erection of precast units shall be supervised and performed by workmen skilled in this type of work. Welding and the qualifications of welders shall be in accordance with AWS D1.1.

### 3.2 JOINT SEALING

Joint sealing shall be as specified in Section 07900 JOINT SEALING.

### 3.3 CLEANING

Not sooner than 72 hours after joints are sealed, faces and other exposed surfaces of precast concrete discolored during erection shall be cleaned to remove dirt and stains by dry scrubbing with a stiff fiber brush, wetting the surface and vigorous scrubbing of the finish with a stiff fiber brush followed by additional washing, or by chemical cleaning compounds such as detergents or other commercial cleaners. Commercial cleaners shall be used in accordance with the manufacturer's recommendations. Cleaning procedure shall be performed on a designated test area and shall be approved prior to proceeding with cleaning work. Discolorations which cannot be removed by these procedures, will be considered defective work. Cleaning work shall be done when temperature and humidity permit surfaces to dry rapidly. Adjacent surfaces shall not be damaged during cleaning operations.

### 3.4 PROTECTION OF WORK

Precast units shall be protected against damage from subsequent operations.

### 3.5 DEFECTIVE WORK

Precast concrete units damaged during erection shall be repaired as soon after occurrence as possible or replaced, as directed, using approved procedures. All repairs to precast concrete units shall match the adjacent surfaces in color and texture and shall be as approved. Unless otherwise approved, repair procedures shall conform to PCI MNL-117.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 04 - MASONRY

SECTION 04200

MASONRY

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, HANDLING, AND STORAGE
  - 1.3.1 Masonry Units
  - 1.3.2 Reinforcement, Anchors, and Ties
  - 1.3.3 Cementitious Materials, Sand and Aggregates

PART 2 PRODUCTS

- 2.1 GENERAL REQUIREMENTS
- 2.2 CLAY OR SHALE BRICK
  - 2.2.1 Solid Clay or Shale Brick
- 2.3 CONCRETE MASONRY UNITS (CMU)
  - 2.3.1 Aggregates
  - 2.3.2 Kinds and Shapes
- 2.4 CORDUROY FLUTED CONCRETE BLOCKS
- 2.5 BURNISHED BLOCK MASONRY UNITS
- 2.6 GLASS BLOCK UNITS AND ACCESSORIES
  - 2.6.1 Solid Glass Block Units
  - 2.6.2 Horizontal Joint Reinforcement
  - 2.6.3 Strip Anchor
  - 2.6.4 Wire-Type Anchor
  - 2.6.5 Expansion Strip
  - 2.6.6 Packing (Backer Rods)
- 2.7 PRECAST CONCRETE ITEMS
  - 2.7.1 Lintels
  - 2.7.2 Splash Blocks
- 2.8 STONE ITEMS
- 2.9 MORTAR
  - 2.9.1 Mortar Admixtures
  - 2.9.2 Coloring
- 2.10 GROUT
  - 2.10.1 Grout Admixtures
  - 2.10.2 Grout Barriers
- 2.11 ANCHORS, TIES, AND BAR POSITIONERS
  - 2.11.1 Wall Ties
  - 2.11.2 Dovetail Anchors
  - 2.11.3 Bar Positioners
- 2.12 JOINT REINFORCEMENT
- 2.13 REINFORCING STEEL BARS AND RODS
- 2.14 CONTROL JOINT KEYS
- 2.15 EXPANSION-JOINT MATERIALS
- 2.16 INSULATION
  - 2.16.1 Rigid Board-Type Insulation

## Grand Forks Phase 2 Levees

- 2.16.1.1 Insulation Thickness and Air Space
- 2.16.1.2 Aged R-Value
- 2.16.1.3 Recovered Material
- 2.16.2 Insulation Adhesive
- 2.17 MASONRY CORE FILL INSULATION
- 2.18 FLASHING
- 2.19 WEEP HOLE VENTILATORS

## PART 3 EXECUTION

- 3.1 ENVIRONMENTAL REQUIREMENTS
  - 3.1.1 Hot Weather Installation
  - 3.1.2 Cold Weather Installation
    - 3.1.2.1 Preparation
    - 3.1.2.2 Completed Masonry and Masonry Not Being Worked On
    - 3.1.2.3 Glass Block Requirements
- 3.2 LAYING MASONRY UNITS
  - 3.2.1 Surface Preparation
  - 3.2.2 Forms and Shores
  - 3.2.3 Concrete Masonry Units
  - 3.2.4 Clay or Shale Brick Units
    - 3.2.4.1 Wetting of Units
    - 3.2.4.2 Solid Units
    - 3.2.4.3 Hollow Units
  - 3.2.5 Tolerances
  - 3.2.6 Cutting and Fitting
  - 3.2.7 Jointing
    - 3.2.7.1 Flush Joints
    - 3.2.7.2 Tooled Joints
    - 3.2.7.3 Door and Window Frame Joints
  - 3.2.8 Joint Widths
    - 3.2.8.1 Concrete Masonry Units
    - 3.2.8.2 Brick
  - 3.2.9 Embedded Items
  - 3.2.10 Unfinished Work
  - 3.2.11 Masonry Wall Intersections
- 3.3 LIMESTONE INSTALLATION
  - 3.3.1 Stone Panels
  - 3.3.2 Limestone Veneer
- 3.4 ANCHORED VENEER CONSTRUCTION
- 3.5 WEEP HOLES
- 3.6 COMPOSITE WALLS
- 3.7 MORTAR
- 3.8 REINFORCING STEEL
  - 3.8.1 Positioning Bars
  - 3.8.2 Splices
- 3.9 JOINT REINFORCEMENT
- 3.10 PLACING GROUT
  - 3.10.1 Horizontal Grout Barriers
  - 3.10.2 Cleanouts
    - 3.10.2.1 Cleanouts for Hollow Unit Masonry Construction
  - 3.10.3 Grouting Equipment
    - 3.10.3.1 Grout Pumps
    - 3.10.3.2 Vibrators
  - 3.10.4 Grout Placement
    - 3.10.4.1 Low-Lift Method
    - 3.10.4.2 High-Lift Method
- 3.11 BOND BEAMS
- 3.12 CONTROL JOINTS



Grand Forks Phase 2 Levees

- 3.13 BRICK EXPANSION JOINTS AND CONCRETE MASONRY VENEER JOINTS
- 3.14 LINTELS
  - 3.14.1 Masonry Lintels
  - 3.14.2 Precast Concrete and Steel Lintels
- 3.15 SILLS AND COPINGS
- 3.16 ANCHORAGE TO CONCRETE
- 3.17 INSULATION
- 3.18 MASONRY CORE FILL INSULATION
- 3.19 SPLASH BLOCKS
- 3.20 POINTING AND CLEANING
  - 3.20.1 Concrete Masonry Unit and Concrete Brick Surfaces
  - 3.20.2 Clay or Shale Brick Surfaces
- 3.21 BEARING PLATES
- 3.22 PROTECTION

-- End of Section Table of Contents --

SECTION 04200

MASONRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |   |
|-------------------|---|
| ASTM A 82         | (1997a) Steel Wire, Plain, for Concrete Reinforcement   |
| ASTM A 153/A 153M | (1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware  |
| ASTM A 615/A 615M | (1996ael) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement                           |
| ASTM C 67         | (1998a) Sampling and Testing Brick and Structural Clay Tile   |
| ASTM C 90         | (1998) Loadbearing Concrete Masonry Units   |
| ASTM C 91         | (1998) Masonry Cement   |
| ASTM C 216        | (1998) Facing Brick (Solid Masonry Units Made from Clay or Shale)                                   |
| ASTM C 270        | (1997ael) Mortar for Unit Masonry   |
| ASTM C 476        | (1998) Grout for Masonry  |
| ASTM C 494        | (1999) Chemical Admixtures for Concrete   |
| ASTM C 516        | (1980) Vermiculite Loose Fill Thermal Insulation  |
| ASTM C 578        | (1995) Rigid, Cellular Polystyrene Thermal Insulation   |
| ASTM C 641        | (1982; R 1991) Staining Materials in Lightweight Concrete Aggregates                                |
| ASTM C 744        | (1998) Prefaced Concrete and Calcium Silicate Masonry Units   |
| ASTM C 780        | (1996) Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry |

|             |   |
|-------------|---|
| ASTM C 1072 | (1998) Measurement of Masonry Flexural Bond Strength                                |
| ASTM C 1289 | (1998) Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board               |
| ASTM D 2000 | (1999) Rubber Products in Automotive Applications                                   |
| ASTM D 2240 | (1997e1) Rubber Property - Durometer Hardness                                       |
| ASTM D 2287 | (1996) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compound |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

Clay or Shale Brick; GA  
Glass Block Units and Accessories; GA  
Burnished Block Masonry Units; GA  
Limestone; GA

Manufacturer's descriptive data.

### SD-13 Certificates

Clay or Shale Brick; FIO  
Concrete Masonry Units (CMU); FIO  
Burnished Block Masonry Units; FIO  
Glass Block Units and Accessories; FIO  
Ashlar limestone units; FIO

Certificates of compliance stating that the materials meet the specified requirements.

### SD-14 Samples

Limestone Items; GA  
Glass Block Units and Accessories; GA  
Clay or Shale Brick; GA  
Burnished Block Masonry Units; GA  
Ashlar limestone; GA  
Corduroy concrete masonry units; GA  
Split face concrete masonry units; GA

Color samples of three stretcher units and one unit for each type of special shape. Units shall show the full range of color and texture.

## 1.3 DELIVERY, HANDLING, AND STORAGE

Materials shall be delivered, handled, stored, and protected to avoid

chipping, breakage, and contact with soil or contaminating material.

#### 1.3.1 Masonry Units

Concrete masonry units shall be covered or protected from inclement weather and shall conform to the moisture content as specified in ASTM C 90 when delivered to the jobsite. In addition, glass block units and prefabricated concrete units shall be stored with their finish surfaces covered. Prefabricated lintels shall be marked on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

#### 1.3.2 Reinforcement, Anchors, and Ties

Steel reinforcing bars, coated anchors, ties, and joint reinforcement shall be stored above the ground. Steel reinforcing bars and uncoated ties shall be free of loose mill scale and rust.

#### 1.3.3 Cementitious Materials, Sand and Aggregates

Cementitious and other packaged materials shall be delivered in unopened containers, plainly marked and labeled with manufacturers' names and brands. Cementitious material shall be stored in dry, weathertight enclosures or be completely covered. Cement shall be handled in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Sand and aggregates shall be stored in a manner to prevent contamination or segregation.

### PART 2 PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

The source of materials which will affect the appearance of the finished work shall not be changed after the work has started except with Contracting Officer's approval.

#### 2.2 CLAY OR SHALE BRICK

Color range and texture of clay or shale brick shall be as indicated and shall conform to the approved sample. Grade SW shall be used for brick in contact with earth or grade and for all exterior work. Brick shall be tested for efflorescence. Clay or shale brick units shall be delivered factory-blended to provide a uniform appearance and color range in the completed wall.

##### 2.2.1 Solid Clay or Shale Brick

Solid clay or shale brick shall conform to ASTM C 216, Type FBS. Brick size shall be utility and the nominal size of the brick used shall be 4 inches thick, 4 inches wide, and 12 inches long. Special 4 inch thick, 4 inches wide and 8 inches long with required as shown on drawings.

#### 2.3 CONCRETE MASONRY UNITS (CMU)

Standard, corduroy, and split-face hollow and solid concrete masonry units shall conform to ASTM C 90, Type I. Cement shall have a low alkali content and be of one brand. The minimum compressive strength (f'm) of the solid and hollow units shall be no less than 1500 psi.

##### 2.3.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with ASTM C 641: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification.

#### 2.3.2 Kinds and Shapes

Units shall be modular in size and shall include closer, jamb, header, lintel, and bond beam units and special shapes and sizes to complete the work as indicated. Units used in exposed masonry surfaces in any one building shall have a uniform fine to medium texture and a uniform color.

#### 2.4 CORDUROY FLUTED CONCRETE BLOCKS

Corduroy concrete blocks shall have 8 equally spaced vertical flutes.

#### 2.5 BURNISHED BLOCK MASONRY UNITS

Concrete blocks for grinding shall conform to ASTM C 90, Type 1. The ground surfaces shall have a factory-applied, heat-treated acrylic finish. Units shall conform to requirements of ASTM C 744 with respect to adhesion, abrasion, color change and resistance to crazing and ASTM C 67 with respect to freezing and thawing.

#### 2.6 GLASS BLOCK UNITS AND ACCESSORIES

Glass block units shall be size, type, pattern, and style specified. Units shall be made of clear colorless glass. Pattern shall be clear with 75 percent light transmission allowance. Ventilators and accessories shall be the products manufactured by or as recommended by the glass block manufacturer.

##### 2.6.1 Solid Glass Block Units

Units shall be 7-5/8 inches by 7-5/8 inches by 3 inches.

##### 2.6.2 Horizontal Joint Reinforcement

Joint reinforcement shall be factory fabricated from steel wire, and shall conform to ASTM A 82. Wire shall be zinc coated after fabrication by the hot-dip process conforming to ASTM A 153/A 153M, Class B-2. Reinforcement shall consist of two or more parallel longitudinal wires not lighter than 9 gauge weld connected with cross wires not lighter than 14 gauge at not greater than 8 inches on center. At least one longitudinal wire for each face of glass block shall be provided. Out-to-out dimension of the longitudinal wires shall be 1-1/2 inches less than the actual width of the block. Joint reinforcement in flat sections not less than 8 feet long shall be provided, except that corner reinforcements and other special shapes may be shorter.

##### 2.6.3 Strip Anchor

Perforated steel strip shall be not less than 20 gauge, minimum of 1-3/4 inches wide by 24 inches long and galvanized after fabrication.

##### 2.6.4 Wire-Type Anchor

Steel wire shall be not less than 9 gauge of approved design suitable for use with the panel stiffener provided and galvanized after fabrication.

#### 2.6.5 Expansion Strip

Dense fibrous glass batt or material shall be as recommended by the glass block manufacturer.

#### 2.6.6 Packing (Backer Rods)

Polyethylene foam, neoprene, or filler shall be as recommended by the sealant manufacturer.

### 2.7 PRECAST CONCRETE ITEMS

Lintels and splashblocks shall be factory-made units from a plant regularly engaged in producing precast concrete units. Unless otherwise indicated, concrete shall be 4,000 psi minimum conforming to Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE using 1/2 inch to No. 4 nominal-size coarse aggregate, and minimum reinforcement shall be the reinforcement required for handling of the units. Clearance of 3/4 inch shall be maintained between reinforcement and faces of units. Unless precast-concrete items have been subjected during manufacture to saturated-steam pressure of at least 120 pounds per square inch for at least 5 hours, the items, after casting, shall be either damp-cured for 24 hours or steam-cured and shall then be aged under cover for 28 days or longer. Cast-concrete members weighing over 80 pounds shall have built-in loops of galvanized wire or other approved provisions for lifting and anchoring. Units shall have beds and joints at right angles to the face, with sharp true arises and shall be cast with drip grooves on the underside where units overhang walls. Exposed-to-view surfaces shall be free of surface voids, spalls, cracks, and chipped or broken edges. Precast units exposed-to-view shall be of uniform appearance and color. Unless otherwise specified, units shall have a smooth dense finish. Prior to use, each item shall be wetted and inspected for crazing. Items showing evidence of dusting, spalling, crazing, or having surfaces treated with a protective coating will be rejected.

#### 2.7.1 Lintels

Precast lintels, unless otherwise shown, shall be of a thickness equal to the wall and reinforced with two No. 4 bars for the full length. Top of lintels shall be labeled "TOP" or otherwise identified and each lintel shall be clearly marked to show location in the structure.

#### 2.7.2 Splash Blocks

Splash blocks shall be as detailed. Reinforcement shall be the manufacturer's standard.

### 2.8 STONE ITEMS

Cut stone shall be Minnesota Dolamitic Limestone and shall be cut to the design shown. Limestone shall be Northern Buff Minnesota Stone. Stone shall have a smooth machine finish free from tool marks.

Split faced stone shall be Minnesota Dolamitic Limestone with Minnesota Spring Stone. Stone heights shall range from 20 percent 1-1/2 inches to 3 inches, 50 percent 3 inches to 6 inches, and 30 percent 6 inches to 9

inches in buff blended colors.

## 2.9 MORTAR

Mortar shall be Type N in accordance with the proportion specification of ASTM C 270 except Type N cement-lime mortar proportions shall be 1 part cement, 1 part lime and 6 parts aggregate; when masonry cement ASTM C 91 is used the maximum air content shall be limited to 12 percent and performance equal to cement-lime mortar shall be verified. Verification of masonry cement performance shall be based on ASTM C 780 and ASTM C 1072. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

### 2.9.1 Mortar Admixtures

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494, Type C.

### 2.9.2 Coloring

Mortar coloring shall be added to the mortar used for exposed masonry surfaces to produce a uniform color. Mortar coloring shall not exceed 3 percent of the weight of cement for carbon black and ten percent of the weight of cement for all other pigments. Mortar coloring shall be chemically inert, of finely ground limeproof pigment, and furnished in accurately pre-measured and packaged units that can be added to a measured amount of cement.

## 2.10 GROUT

Grout shall conform to ASTM C 476. Cement used in grout shall have a low alkali content. Grout slump shall be between 8 and 10 inches. Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the work unless additional evidence is furnished that the grout meets the specified requirements.

### 2.10.1 Grout Admixtures

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494, Type C.

### 2.10.2 Grout Barriers

Grout barriers for vertical cores shall consist of fine mesh wire, fiberglass, or expanded metal.

## 2.11 ANCHORS, TIES, AND BAR POSITIONERS

Anchors and ties shall be fabricated without drips or crimps and shall be zinc-coated in accordance with ASTM A 153/A 153M, Class B-2. Steel wire used for anchors and ties shall be fabricated from steel wire conforming to ASTM A 82. Anchors and ties shall be sized to provide a minimum of 5/8 inch mortar cover from either face.

#### 2.11.1 Wall Ties

Wall ties shall be rectangular-shaped or Z-shaped fabricated of 3/16 inch diameter zinc-coated steel wire. Rectangular wall ties shall be no less than 4 inches wide. Wall ties may also be of a continuous type conforming to paragraph JOINT REINFORCEMENT. Adjustable type wall ties, if approved for use, shall consist of two essentially U-shaped elements fabricated of 3/16 inch diameter zinc-coated steel wire. Adjustable ties shall be of the double pintle to eye type and shall allow a maximum of 1/2 inch eccentricity between each element of the tie. Play between pintle and eye opening shall be not more than 1/16 inch. The pintle and eye elements shall be formed so that both can be in the same plane.

#### 2.11.2 Dovetail Anchors

Dovetail anchors shall be of the flexible wire type, 3/16 inch diameter zinc-coated steel wire, triangular shaped, and attached to a 12 gauge or heavier steel dovetail section. These anchors shall be used for anchorage of veneer wythes or composite-wall facings extending over the face of concrete columns, beams, or walls. Cells within vertical planes of these anchors shall be filled solid with grout for full height of walls or partitions, or solid units may be used. Dovetail slots are specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

#### 2.11.3 Bar Positioners

Bar positioners, used to prevent displacement of reinforcing bars during the course of construction, shall be factory fabricated from 9 gauge steel wire or equivalent, and coated with a hot-dip galvanized finish. Not more than one wire shall cross the cell.

#### 2.12 JOINT REINFORCEMENT

Joint reinforcement shall be factory fabricated from steel wire conforming to ASTM A 82, welded construction. Tack welding will not be acceptable in reinforcement used for wall ties. Wire shall have zinc coating conforming to ASTM A 153/A 153M, Class B-2. All diagonal wires shall be a minimum of 9 gauge. All longitudinal wires shall be a minimum of 3/16 inch. Reinforcement shall be ladder type design, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units. Joint reinforcement shall be placed a minimum of 5/8 inch cover from either face. The distance between crosswires shall not exceed 16 inches. Joint reinforcement for straight runs shall be furnished in flat sections not less than 10 feet long. Joint reinforcement shall be provided with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features.

#### 2.13 REINFORCING STEEL BARS AND RODS

Reinforcing steel bars and rods shall conform to ASTM A 615/A 615M, Grade 60.

#### 2.14 CONTROL JOINT KEYS

Control joint keys shall be a factory fabricated solid section of natural or synthetic rubber (or combination thereof) conforming to ASTM D 2000 or polyvinyl chloride conforming to ASTM D 2287. The material shall be resistant to oils and solvents. The control joint key shall be provided with a solid shear section not less than 5/8 inch thick and 3/8 inch thick



flanges, with a tolerance of plus or minus 1/16 inch. The control joint key shall fit neatly, but without forcing, in masonry unit jamb sash grooves. The control joint key shall be flexible at a temperature of minus 30 degrees F after five hours exposure, and shall have a durometer hardness of not less than 70 when tested in accordance with ASTM D 2240.

## 2.15 EXPANSION-JOINT MATERIALS

Backer rod and sealant shall be adequate to accommodate joint compression equal to 50 percent of the width of the joint. The backer rod shall be compressible rod stock of polyethylene foam, polyurethane foam, butyl rubber foam, or other flexible, nonabsorptive material as recommended by the sealant manufacturer. Sealant shall conform to Section 07900JOINT SEALING.

## 2.16 INSULATION

### 2.16.1 Rigid Board-Type Insulation

Rigid board-type insulation shall be extruded polystyrene, polyurethane, or polyisocyanurate. Polystyrene shall conform to ASTM C 578. Polyurethane or polyisocyanurate shall conform to ASTM C 1289, Type I, Class 2, faced with aluminum foil on both sides of the foam. The insulation shall be a standard product and shall be marked with not less than the manufacturer's trademark or name, the specification number, the permeance and R-values.

#### 2.16.1.1 Insulation Thickness and Air Space

The cavity space shall allow for a maximum insulation thickness of 1.5 inches, and a minimum air space of 1 inch.

#### 2.16.1.2 Aged R-Value

The insulation shall provide a minimum aged R-value of 7.5 for the overall thickness. The aged R-value shall be determined at 75 degrees F in accordance with the appropriate referenced specification. The stated R-value of the insulation shall be certified by an independent testing laboratory or certified by an independent Registered Professional Engineer if tests are conducted in the manufacturer's laboratory.

#### 2.16.1.3 Recovered Material

Insulation shall contain the highest practicable percentage of recovered material derived from solid waste (but material reused in the manufacturing process cannot be counted toward the percentage of recovered material). Where two materials have the same price and performance, the one containing the higher recovered material content shall be provided. The polyurethane or polyisocyanurate foam shall have a minimum recovered material content of 9 percent by weight of the core material.

### 2.16.2 Insulation Adhesive

Insulation adhesive shall be specifically prepared to adhere the insulation to the masonry and, where applicable, to the thru-wall flashing. The adhesive shall not deleteriously affect the insulation, and shall have a record of satisfactory and proven performance for the conditions under which to be used.

## 2.17 MASONRY CORE FILL INSULATION

Core fill insulation shall be a lightweight, free-flowing inorganic vermiculite, specially treated for water repellancy and a dry loose weight of 4.5-7.0 pcf and capable of supporting its own weight. Insulation shall meet requirements of ASTM C 516, Type II.

## 2.18 FLASHING

Flashing shall be as specified in Section 07600 SHEET METALWORK, GENERAL.

## 2.19 WEEP HOLE VENTILATORS

Weephole ventilators shall be prefabricated aluminum grill type vents designed to prevent insect entry with maximum air entry. Ventilators shall be sized to match modular construction with a standard 3/8 inch mortar joint.

## PART 3 EXECUTION

### 3.1 ENVIRONMENTAL REQUIREMENTS

#### 3.1.1 Hot Weather Installation

The following precautions shall be taken if masonry is erected when the ambient air temperature is more than 99 degrees F in the shade and the relative humidity is less than 50 percent. All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than 4 feet ahead of masonry; masonry units shall be set within one minute of spreading mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.

#### 3.1.2 Cold Weather Installation

Before erecting masonry when ambient temperature or mean daily air temperature falls below 40 degrees F, a written statement of proposed cold weather construction procedures shall be submitted for approval. The following precautions shall be taken during all cold weather erection.

##### 3.1.2.1 Preparation

Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.

- a. Air Temperature 40 to 32 Degrees F. Sand or mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F.
- b. Air Temperature 32 to 25 Degrees F. Sand and mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing.
- c. Air Temperature 25 to 20 Degrees F. Sand and mixing water shall be heated to provide mortar temperatures between 40 degrees F and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed

when wind is in excess of 15 mph.

- d. Air Temperature 20 Degrees F and below. Sand and mixing water shall be heated to provide mortar temperatures between 40 degrees F and 120 degrees F. Enclosure and auxiliary heat shall be provided to maintain air temperature above 32 degrees F. Temperature of units when laid shall not be less than 20 degrees F.

3.1.2.2 Completed Masonry and Masonry Not Being Worked On

- a. Mean daily air temperature 40 degrees F to 32 degrees F. Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.
- b. Mean daily air temperature 32 degrees F to 25 degrees F. Masonry shall be completely covered with weather-resistant membrane for 24 hours.
- c. Mean Daily Air Temperature 25 Degrees F to 20 Degrees F. Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.
- d. Mean Daily Temperature 20 Degrees F and Below. Masonry temperature shall be maintained above 32 degrees F for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps, or other approved methods.

3.1.2.3 Glass Block Requirements

Glass block shall not be laid when the air temperature is below 40 degrees F on a falling thermometer, or when it appears probable that temperatures below 40 degrees F will be encountered before the mortar has set, unless adequate means are provided for protecting the work from freezing. Protection shall consist of heating and maintaining the temperature of the glass block and mortar materials at not less than 40 degrees F and not more than 160 degrees F. After erection, an air temperature above 40 degrees F on both sides of the glass block shall be maintained for not less than 72 hours. Work will not be permitted with or on frozen materials. Glass block work may be started at 34 degrees F on a rising thermometer.

3.2 LAYING MASONRY UNITS

Masonry units shall be laid in running bond pattern. Facing courses shall be level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances shall be plus or minus 1/2 inch. Each unit shall be adjusted to its final position while mortar is still soft and plastic. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and relaid with fresh mortar. Air spaces, cavities, chases, expansion joints, and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be selected from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb. Units being laid and surfaces to receive units shall be free of water film and frost. Solid units shall be laid in a nonfurrowed full bed of mortar. Mortar for veneer wythes shall be beveled and sloped toward the center of the wythe from the cavity side. Units shall be shoved into place so that the vertical joints are tight. Vertical joints of brick and the vertical face shells of concrete masonry units, except where indicated at control, expansion, and isolation

joints, shall be completely filled with mortar. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Means shall be provided to prevent mortar from dropping into the space below. In double wythe construction, the inner wythe may be brought up not more than 16 inches ahead of the outer wythe. Collar joints shall be filled with mortar or grout during the laying of the facing wythe, and filling shall not lag the laying of the facing wythe by more than 8 inches.

### 3.2.1 Surface Preparation

Surfaces upon which masonry is placed shall be cleaned of laitance, dust, dirt, oil, organic matter, or other foreign materials and shall be slightly roughened to provide a surface texture with a depth of at least 1/8 inch. Sandblasting shall be used, if necessary, to remove laitance from pores and to expose the aggregate.

### 3.2.2 Forms and Shores

Forms and shores shall be sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout. Supporting forms and shores shall not be removed in less than 10 days.

### 3.2.3 Concrete Masonry Units

Units in piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Foundation walls below grade shall be grouted solid. Jamb units shall be of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved. Double walls shall be stiffened at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of the double wall. Walls and partitions shall be adequately reinforced for support of wall-hung plumbing fixtures when chair carriers are not specified.

### 3.2.4 Clay or Shale Brick Units

Brick facing shall be laid with the better face exposed. Brick shall be laid in running bond with each course bonded at corners, unless otherwise indicated. Molded brick shall be laid with the frog side down. Brick that is cored, recessed, or has other deformations may be used in sills, treads, soldier courses, except where deformations will be exposed to view.

#### 3.2.4.1 Wetting of Units

Wetting of clay, shale brick, or hollow brick units having an initial rate of absorption of more than 1 gram per minute per square inch of bed surface shall be in conformance with ASTM C 67. The method of wetting shall ensure that each unit is nearly saturated but surface dry when laid.

#### 3.2.4.2 Solid Units

Bed, head, and collar joints shall be completely filled with mortar.

## 3.2.4.3 Hollow Units

Hollow units shall be laid as specified for concrete masonry units.

## 3.2.5 Tolerances

Masonry shall be laid plumb, true to line, with courses level. Bond pattern shall be kept plumb throughout. Corners shall be square unless noted otherwise. Except for walls constructed of prefaced concrete masonry units, masonry shall be laid within the following tolerances (plus or minus unless otherwise noted):

TABLE II

## TOLERANCES

Variation from the plumb in the lines  
and surfaces of columns, walls and arises

---

|                           |          |
|---------------------------|----------|
| In adjacent masonry units | 1/8 inch |
| In 10 feet                | 1/4 inch |
| In 20 feet                | 3/8 inch |
| In 40 feet or more        | 1/2 inch |

Variations from the plumb for external corners,  
expansion joints, and other conspicuous lines

---

|                    |          |
|--------------------|----------|
| In 20 feet         | 1/4 inch |
| In 40 feet or more | 1/2 inch |

Variations from the level for exposed lintels,  
sills, parapets, horizontal grooves, and other  
conspicuous lines

---

|                    |          |
|--------------------|----------|
| In 20 feet         | 1/4 inch |
| In 40 feet or more | 1/2 inch |

Variation from level for bed joints and top  
surfaces of bearing walls

---

|                    |          |
|--------------------|----------|
| In 10 feet         | 1/4 inch |
| In 40 feet or more | 1/2 inch |

Variations from horizontal lines

---

|                    |          |
|--------------------|----------|
| In 10 feet         | 1/4 inch |
| In 20 feet         | 3/8 inch |
| In 40 feet or more | 1/2 inch |

Variations in cross sectional dimensions of  
columns and in thickness of walls

## TOLERANCES

|       |          |
|-------|----------|
| Minus | 1/4 inch |
| Plus  | 1/2 inch |

## 3.2.6 Cutting and Fitting

Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Openings in the masonry shall be made carefully so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Reinforced masonry lintels shall be provided above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

## 3.2.7 Jointing

Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

## 3.2.7.1 Flush Joints

Joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall.

## 3.2.7.2 Tooled Joints

Joints in exposed exterior and interior masonry surfaces shall be tooled slightly concave. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

## 3.2.7.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch. On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch.

## 3.2.8 Joint Widths

Joint widths shall be as follows:

## 3.2.8.1 Concrete Masonry Units

Concrete masonry units shall have 3/8 inch joints.

## 3.2.8.2 Brick

Brick joint widths shall be the difference between the actual and nominal

dimensions of the brick in either height or length. Brick expansion joint widths shall be as shown.

#### 3.2.9 Embedded Items

Spaces around built-in items shall be filled with mortar. Openings around flush-mount electrical outlet boxes in wet locations shall be pointed with mortar. Anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in shall be embedded as the masonry work progresses. Anchors, ties and joint reinforcement shall be fully embedded in the mortar. Cells receiving anchor bolts and cells of the first course below bearing plates shall be filled with grout.

#### 3.2.10 Unfinished Work

Unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. Loose mortar shall be removed and the exposed joints shall be thoroughly cleaned before laying new work.

#### 3.2.11 Masonry Wall Intersections

Each course shall be masonry bonded at corners and elsewhere as shown. Masonry walls shall be anchored or tied together at corners and intersections with bond beam reinforcement and prefabricated corner or tee pieces of joint reinforcement as shown.

### 3.3 LIMESTONE INSTALLATION

#### 3.3.1 Stone Panels

Stone panels shall be set in place following manufacturer's recommendations. Fill anchors, pins, and accessories shall be stainless steel.

#### 3.3.2 Limestone Veneer

Limestone veneer shall be set in random pattern.

### 3.4 ANCHORED VENEER CONSTRUCTION

The inner and outer wythes shall be completely separated by a continuous airspace as shown on the drawings. Both the inner and the outer wythes shall be laid up together except when adjustable joint reinforcement assemblies are approved for use. When both wythes are not brought up together, through-wall flashings shall be protected from damage until they are fully enclosed in the wall. The airspace between the wythes shall be kept clear and free of mortar droppings by temporary wood strips laid on the wall ties and carefully lifted out before placing the next row of ties.

A coarse gravel or drainage material shall be placed behind the weep holes in the cavity to a minimum depth of 4 inches of coarse aggregate or 10 inches of drainage material to keep mortar droppings from plugging the weep holes.

### 3.5 WEEP HOLES

Weep holes shall be provided not more than 24 inches on centers in mortar joints of the exterior wythe above wall flashing, over foundations, bond beams, and any other horizontal interruptions of the cavity. Weep holes

shall be constructed using weep hole ventilators. Other approved methods may be used for providing weep holes. Weep holes shall be kept free of mortar and other obstructions.

### 3.6 COMPOSITE WALLS

Masonry wythes shall be tied together with joint reinforcement or with unit wall ties. Facing shall be anchored to concrete backing with wire dovetail anchors set in slots built in the face of the concrete as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. The facing wythe shall be anchored or tied to the backup at a maximum spacing of 16 inches on center vertically and 24 inches on center horizontally. Unit ties shall be spaced not over 24 inches on centers horizontally, in courses not over 16 inches apart vertically, staggered in alternate courses. Ties shall be laid not closer than 5/8 inch to either masonry face. Ties shall not extend through control joints. Collar joints between masonry facing and masonry backup shall be filled solidly with grout.

### 3.7 MORTAR

Mortar shall be mixed in a mechanically operated mortar mixer for at least 3 minutes, but not more than 5 minutes. Measurement of ingredients for mortar shall be by volume. Ingredients not in containers, such as sand, shall be accurately measured by the use of measuring boxes. Water shall be mixed with the dry ingredients in sufficient amount to provide a workable mixture which will adhere to the vertical surfaces of masonry units. Mortar that has stiffened because of loss of water through evaporation shall be retempered by adding water to restore the proper consistency and workability. Mortar that has reached its initial set or that has not been used within 2-1/2 hours after mixing shall be discarded.

### 3.8 REINFORCING STEEL

Reinforcement shall be cleaned of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond prior to placing grout. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement shall be placed prior to grouting. Unless otherwise indicated, vertical wall reinforcement shall extend to within 2 inches of tops of walls.

#### 3.8.1 Positioning Bars

Vertical bars shall be accurately placed within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be maintained between the bars and masonry units. Minimum clearance between parallel bars shall be one diameter of the reinforcement. Vertical reinforcing may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement. Column and pilaster ties shall be wired in position around the vertical steel. Ties shall be in contact with the vertical reinforcement and shall not be placed in horizontal bed joints.

#### 3.8.2 Splices

Bars shall be lapped a minimum of 48 diameters of the reinforcement. Welded or mechanical connections shall develop at least 125 percent of the specified yield strength of the reinforcement.

### 3.9 JOINT REINFORCEMENT



Joint reinforcement shall be installed at 8 inches on center or as indicated. Reinforcement shall be lapped not less than 6 inches. Prefabricated sections shall be installed at corners and wall intersections. The longitudinal wires of joint reinforcement shall be placed to provide not less than 5/8 inch cover to either face of the unit.

### 3.10 PLACING GROUT

Cells containing reinforcing bars shall be filled with grout. Hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces shall be filled solid with grout. Cells under lintel bearings on each side of openings shall be filled solid with grout for full height of openings. Walls below grade, lintels, and bond beams shall be filled solid with grout. Units other than open end units may require grouting each course to preclude voids in the units. Grout not in place within 1-1/2 hours after water is first added to the batch shall be discarded. Sufficient time shall be allowed between grout lifts to preclude displacement or cracking of face shells of masonry units. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, the wall shall be torn down and rebuilt.

#### 3.10.1 Horizontal Grout Barriers

Grout barriers shall be embedded in mortar below cells of hollow units receiving grout.

#### 3.10.2 Cleanouts

##### 3.10.2.1 Cleanouts for Hollow Unit Masonry Construction

Cleanout holes shall be provided at the bottom of every pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet. Where all cells are to be grouted, cleanout courses shall be constructed using bond beam units in an inverted position to permit cleaning of all cells. Cleanout holes shall be provided at a maximum spacing of 32 inches where all cells are to be filled with grout. A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanouts shall not be less than 3 by 4 inch openings cut from one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Cleanout holes shall not be closed until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

#### 3.10.3 Grouting Equipment

##### 3.10.3.1 Grout Pumps

Pumping through aluminum tubes will not be permitted. Pumps shall be operated to produce a continuous stream of grout without air pockets, segregation, or contamination. Upon completion of each day's pumping, waste materials and debris shall be removed from the equipment, and disposed of outside the masonry.

##### 3.10.3.2 Vibrators

Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. At least one spare vibrator shall be maintained at the site at all times. Vibrators shall be applied at uniformly spaced points not further apart than the visible effectiveness of the machine. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing segregation.

#### 3.10.4 Grout Placement

Masonry shall be laid to the top of a pour before placing grout. Grout shall not be placed in two-wythe solid unit masonry cavity until mortar joints have set for at least 3 days during hot weather and 5 days during cold damp weather. Grout shall not be placed in hollow unit masonry until mortar joints have set for at least 24 hours. Grout shall be placed using a hand bucket, concrete hopper, or grout pump to completely fill the grout spaces without segregation of the aggregates. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. The height of grout pours and type of grout used shall be limited by the dimensions of grout spaces as indicated in Table III. Low-lift grout methods may be used on pours up to and including 5 feet in height. High-lift grout methods shall be used on pours exceeding 5 feet in height.

##### 3.10.4.1 Low-Lift Method

Grout shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. Mortar protruding more than 1/2 inch into the grout space shall be removed before beginning the grouting operation. Grout pours 12 inches or less in height shall be consolidated by mechanical vibration or by puddling. Grout pours over 12 inches in height shall be consolidated by mechanical vibration and reconsolidated by mechanical vibration after initial water loss and settlement has occurred. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. Low-lift grout shall be used subject to the limitations of Table III.

##### 3.10.4.2 High-Lift Method

Mortar droppings shall be cleaned from the bottom of the grout space and from reinforcing steel. Mortar protruding more than 1/4 inch into the grout space shall be removed by dislodging the projections with a rod or stick as the work progresses. Reinforcing, bolts, and embedded connections shall be rigidly held in position before grouting is started. CMU units shall not be pre-wetted. Grout, from the mixer to the point of deposit in the grout space shall be placed as rapidly as practical by pumping and placing methods which will prevent segregation of the mix and cause a minimum of grout splatter on reinforcing and masonry surfaces not being immediately encased in the grout lift. The individual lifts of grout shall be limited to 4 feet in height. The first lift of grout shall be placed to a uniform height within the pour section and vibrated thoroughly to fill all voids. This first vibration shall follow immediately behind the pouring of the grout using an approved mechanical vibrator. After a waiting period sufficient to permit the grout to become plastic, but before it has taken any set, the succeeding lift shall be poured and vibrated 12 to 18 inches into the preceding lift. If the placing of the succeeding lift is going to be delayed beyond the period of workability of the preceding, each lift shall be reconsolidated by reworking with a second vibrator as soon as the grout has taken its settlement shrinkage. The waiting, pouring, and reconsolidation steps shall be repeated until the top of the pour is reached. The top lift shall be reconsolidated after the

required waiting period. The high-lift grouting of any section of wall between vertical grout barriers shall be completed to the top of a pour in one working day unless a new series of cleanout holes is established and the resulting horizontal construction joint cleaned. High-lift grout shall be used subject to the limitations in Table III.

TABLE III

## POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

| Maximum<br>Grout Pour<br>Height<br>(feet) (4) | Grout<br>Type | Grouting<br>Procedure | Minimum Dimensions of the<br>Total Clear Areas Within Grout<br>Spaces and Cells (in.) (1,2) |                        |
|---|---------------|-----------------------|---|------------------------|
|   |               |                       | Multiwythe<br>Masonry (3)   | Hollow-unit<br>Masonry |
| 1   | Fine          | Low Lift              | 3/4   | 1-1/2 x 2              |
| 5   | Fine          | Low Lift              | 2   | 2 x 3                  |
| 8   | Fine          | High Lift             | 2   | 2 x 3                  |
| 12  | Fine          | High Lift             | 2-1/2   | 2-1/2 x 3              |
| 24  | Fine          | High Lift             | 3   | 3 x 3                  |
| 1   | Coarse        | Low Lift              | 1-1/2   | 1-1/2 x 3              |
| 5   | Coarse        | Low Lift              | 2   | 2-1/2 x 3              |
| 8   | Coarse        | High Lift             | 2   | 3 x 3                  |
| 12  | Coarse        | High Lift             | 2-1/2   | 3 x 3                  |
| 24  | Coarse        | High Lift             | 3   | 3 x 4                  |

## Notes:

- (1) The actual grout space or cell dimension must be larger than the sum of the following items:
  - a) The required minimum dimensions of total clear areas given in the table above;
  - b) The width of any mortar projections within the space;
  - c) The horizontal projections of the diameters of the horizontal reinforcing bars within a cross section of the grout space or cell.
- (2) The minimum dimensions of the total clear areas shall be made up of one or more open areas, with at least one area being 3/4 inch or greater in width.
- (3) For grouting spaces between masonry wythes.
- (4) Where only cells of hollow masonry units containing reinforcement are grouted, the maximum height of the pour shall not exceed the distance between horizontal bond beams.

## 3.11 BOND BEAMS

Bond beams shall be filled with grout and reinforced as indicated on the drawings. Grout barriers shall be installed under bond beam units to retain the grout as required. Reinforcement shall be continuous, including around corners. Where splices are required for continuity, reinforcement shall be lapped 48 bar diameters. A minimum clearance of 1/2 inch shall be maintained between reinforcement and interior faces of units.

## 3.12 CONTROL JOINTS

Control joints shall be provided as indicated and shall be constructed by using sash jamb units with control joint key in accordance with the details shown on the drawings. Sash jamb units shall have a 3/4 by 3/4 inch groove near the center at end of each unit. The vertical mortar joint at control joint locations shall be continuous, including through all bond beams. This shall be accomplished by utilizing half blocks in alternating courses on each side of the joint. The control joint key shall be interrupted in courses containing continuous bond beam steel. In single wythe exterior masonry walls, the exterior control joints shall be raked to a depth of 3/4 inch; backer rod and sealant shall be installed in accordance with Section 07900 JOINT SEALING. Exposed interior control joints shall be raked to a depth of 1/4 inch. Concealed control joints shall be flush cut.

### 3.13 BRICK EXPANSION JOINTS AND CONCRETE MASONRY VENEER JOINTS

Brick expansion joints and concrete masonry veneer joints shall be provided and constructed as shown on the drawings. Joints shall be kept free of mortar and other debris.

### 3.14 LINTELS

#### 3.14.1 Masonry Lintels

Masonry lintels shall be constructed with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated on the drawings. Lintel reinforcement shall extend beyond each side of masonry opening 40 bar diameters or 24 inches, whichever is greater. Reinforcing bars shall be supported in place prior to grouting and shall be located 1/2 inch above the bottom inside surface of the lintel unit.

#### 3.14.2 Precast Concrete and Steel Lintels

Precast concrete and steel lintels shall be as shown on the drawings. Lintels shall be set in a full bed of mortar with faces plumb and true. Steel and precast lintels shall have a minimum bearing length of 8 inches unless otherwise indicated on the drawings. See Section 05120 STRUCTURAL STEEL for steel lintel requirements.

### 3.15 SILLS AND COPINGS

Sills and copings shall be set in a full bed of mortar with faces plumb and true.

### 3.16 ANCHORAGE TO CONCRETE

Anchorage of masonry to the face of concrete columns, beams, or walls shall be with dovetail anchors spaced not over 16 inches on centers vertically and 24 inches on center horizontally.

### 3.17 INSULATION

Anchored veneer walls shall be insulated, where shown, by installing board-type insulation on the cavity side of the inner wythe. Board type insulation shall be applied directly to the masonry or thru-wall flashing with adhesive. Insulation shall be neatly fitted between obstructions without impaling of insulation on ties or anchors. The insulation shall be applied in parallel courses with vertical joints breaking midway over the course below and shall be applied in moderate contact with adjoining

units without forcing, and shall be cut to fit neatly against adjoining surfaces.

### 3.18 MASONRY CORE FILL INSULATION

Insulation shall be poured from the bag or hopper directly into the concrete block core or wall cavity. Pours can be made at any interval, but not to exceed 20 feet in height, without requiring bridging. Rodding and tamping are not required.

### 3.19 SPLASH BLOCKS

Splash blocks shall be located as shown.

### 3.20 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, mortar and grout daubs or splashings shall be completely removed from masonry-unit surfaces that will be exposed or painted. Before completion of the work, defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Immediately after grout work is completed, scum and stains which have percolated through the masonry work shall be removed using a high pressure stream of water and a stiff bristled brush. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

#### 3.20.1 Concrete Masonry Unit and Concrete Brick Surfaces

Exposed concrete masonry unit and concrete brick surfaces shall be dry-brushed at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

#### 3.20.2 Clay or Shale Brick Surfaces

Exposed clay or shale brick masonry surfaces shall be cleaned as necessary to obtain surfaces free of stain, dirt, mortar and grout daubs, efflorescence, and discoloration or scum from cleaning operations. After cleaning, the sample panel of similar material shall be examined for discoloration or stain as a result of cleaning. If the sample panel is discolored or stained, the method of cleaning shall be changed to assure that the masonry surfaces in the structure will not be adversely affected. The exposed masonry surfaces shall be water-soaked and then cleaned with a solution proportioned 1/2 cup trisodium phosphate and 1/2 cup laundry detergent to one gallon of water or cleaned with a proprietary masonry cleaning agent specifically recommended for the color and texture by the clay products manufacturer. The solution shall be applied with stiff fiber brushes, followed immediately by thorough rinsing with clean water. Proprietary cleaning agents shall be used in conformance with the cleaning product manufacturer's printed recommendations. Efflorescence shall be removed in conformance with the brick manufacturer's recommendations.

### 3.21 BEARING PLATES

Bearing plates for beams, joists, joist girders and similar structural members shall be set to the proper line and elevation with damp-pack

bedding mortar, except where non-shrink grout is indicated. Bedding mortar and non-shrink grout shall be as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

### 3.22 PROTECTION

Facing materials shall be protected against staining. Top of walls shall be covered with nonstaining waterproof covering or membrane when work is not in progress. Covering of the top of the unfinished walls shall continue until the wall is waterproofed with a complete roof or parapet system. Covering shall extend a minimum of 2 feet down on each side of the wall and shall be held securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05055

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DETAIL DRAWINGS
- 1.4 QUALIFICATION OF WELDERS AND WELDING OPERATORS
- 1.5 FRACTURE CONTROL PLAN (FCP)

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Materials Orders
  - 2.1.2 Materials List
  - 2.1.3 Shipping Bill
  - 2.1.4 Fracture Critical Members (FCM)
- 2.2 FABRICATION
  - 2.2.1 Structural Fabrication
    - 2.2.1.1 Dimensional Tolerances for Structural Work
    - 2.2.1.2 Structural Steel Fabrication
    - 2.2.1.3 Structural Aluminum Fabrication
  - 2.2.2 Welding
    - 2.2.2.1 Welding of Structural Steel
    - 2.2.2.2 Welding of Steel Castings
    - 2.2.2.3 Welding of Aluminum
    - 2.2.2.4 Welding of Steel Studs
    - 2.2.2.5 Welding of Stainless Steel
  - 2.2.3 Bolted Connections
    - 2.2.3.1 Bolted Structural Steel Connections
    - 2.2.3.2 Bolted Aluminum Connections
  - 2.2.4 Riveted Connections
    - 2.2.4.1 Riveted Structural Steel Connections
    - 2.2.4.2 Riveted Aluminum Connections
  - 2.2.5 Machine Work
    - 2.2.5.1 Finished Surfaces
    - 2.2.5.2 Unfinished Surfaces
  - 2.2.6 Miscellaneous Provisions
    - 2.2.6.1 Metallic Coatings
  - 2.2.7 Shop Assembly
- 2.3 TESTS, INSPECTIONS, AND VERIFICATIONS
  - 2.3.1 Nondestructive Testing
  - 2.3.2 Tests of Machinery and Structural Units
  - 2.3.3 Inspection of Structural Steel Welding
    - 2.3.3.1 Visual Examination
    - 2.3.3.2 Nondestructive Examination
    - 2.3.3.3 Test Coupons
    - 2.3.3.4 Supplemental Examination

2.3.4 Structural Steel Welding Repairs

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Alignment and Setting

3.1.2 Blocking and Wedges

3.2 PROTECTION OF FINISHED WORK

3.2.1 Machined Surfaces

3.2.2 Aluminum

3.3 TESTS

3.3.1 Workmanship

3.3.2 Production Welding

-- End of Section Table of Contents --



SECTION 05055

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

|           |  |
|-----------|--|
| AA SAS-30 | (1986) Aluminum Structures Construction Manual Series - Section 1 Specifications for Aluminum Structures |
|-----------|--|

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |  |
|-------------------|--|
| ASTM A 36/A 36M   | (1997a) Carbon Structural Steel  |
| ASTM A 123        | (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products  |
| ASTM A 325        | (1994) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength   |
| ASTM A 514/A 514M | (1994a) High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding   |
| ASTM A 709/A 709M | (2000) Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched-and-Tempered Alloy Structural Steel Plate for Bridges |
| ASTM A 780        | (1993a) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings   |
| ASTM D 962        | (1981; R 1994) Aluminum Powder and Paste Pigments for Paints   |
| ASTM E 165        | (1995) Liquid Penetrant Examination Inspection Method  |
| ASTM E 709        | (1995) Magnetic Particle Examination   |

ASME INTERNATIONAL (ASME)

|            |  |
|------------|--|
| ASME B4.1  | (1967; R 1994) Preferred Limits and Fits for Cylindrical Parts |
| ASME B46.1 | (1995) Surface Texture (Surface Roughness,                     |

Waviness, and Lay)

ASME BPV IX (1998) Boiler and Pressure Vessel Code;  
Section IX, Welding and Brazing  
Qualifications

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2000) Structural Welding Code - Steel  
AWS D1.2 (1997) Structural Welding Code - Aluminum  
AWS D1.5 (1996) Bridge Welding Code  
AWS D1.6 (1999) Structural Welding Code - Stainless  
Steel

\

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE AMS 3110 (1992; Rev G) Primer Zinc Chromate  
SAE AMS 3132 (1994; Rev F) Varnish, Phenolic Resin  
Corrosion-Preventive

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation;  
submittals having an "FIO" designation are for information only. The  
following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Welding of Structural Steel; FIO

Schedules of welding procedures for steel structures shall be  
submitted and approved prior to commencing fabrication.

Welding of Aluminum; FIO

Schedules of welding processes for aluminum fabrications shall  
be submitted and approved prior to commencing fabrication.

Structural Steel Welding Repairs; GA

Welding repair plans for steel shall be submitted and approved  
prior to making repairs.

Materials Orders; FIO

Copies of purchase orders, mill orders, shop orders and work  
orders for materials shall be submitted prior to the use of the  
materials in the work.

Materials List; FIO

Materials list for fabricated items shall be submitted at the  
time of submittal of detail drawings.

Shipping Bill; FIO

Shipping bill shall be submitted with the delivery of finished pieces to the site.

Fracture Control Plan (FCP); GA

Welding procedures, qualifications, and certifications shall be submitted showing compliance with FCP requirements.

#### SD-04 Drawings

Detail Drawings; GA

Detail drawings for metalwork and machine work shall be submitted and approved prior to fabrication.

#### SD-09 Reports

Tests, Inspections, and Verifications; FIO

Certified test reports for materials shall be submitted with all materials delivered to the site.

#### SD-13 Certificates

Qualification of Welders and Welding Operators; FIO

Certifications for welders and welding operators shall be submitted prior to commencing fabrication.

Application Qualification for Steel Studs; FIO

Certified reports for the application qualification for steel studs shall be submitted and approved prior to commencing fabrication.

Welding of Aluminum; FIO

Certified report for aluminum welding qualification tests shall be submitted and approved prior to commencing welding.

### 1.3 DETAIL DRAWINGS

Detail drawings for metalwork and machine work shall include catalog cuts, templates, fabrication and assembly details and type, grade and class of material as appropriate. Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the detail drawings.

### 1.4 QUALIFICATION OF WELDERS AND WELDING OPERATORS

The Contractor shall certify that the qualification of welders and welding operators and tack welders who will perform structural steel welding have been qualified for the particular type of work to be done in accordance with the requirements of AWS D1.1, Section 5, unless specified otherwise, prior to commencing fabrication. The certificate shall list the qualified welders by name and shall specify the code and procedures under which qualified and the date of qualification. Prior qualification will be accepted if welders have performed satisfactory work under the code for

which qualified within the preceding three months. The Contractor shall require welders to repeat the qualifying tests when their work indicates a reasonable doubt as to proficiency. Those passing the requalification tests will be recertified. Those not passing will be disqualified until passing. All expenses in connection with qualification and requalification shall be borne by the Contractor.

#### 1.5 FRACTURE CONTROL PLAN (FCP)

A FCP is required for welding on all Fracture Critical Members (FCM) and shall be in accordance with AWS D1.5, Section 12. The contractor shall show that these requirements can be met through proper certification and documentation.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

##### 2.1.1 Materials Orders

The Contractor shall furnish 3 copies of purchase orders, mill orders, shop orders and work orders for all materials orders and items used in the work.

Where mill tests are required purchase orders shall contain the test site address and the name of the testing agency.

##### 2.1.2 Materials List

The Contractor shall furnish a materials list of the materials to be used in the fabrication of each item.

##### 2.1.3 Shipping Bill

The Contractor shall furnish a shipping bill or memorandum of each shipment of finished pieces or members to the project site giving the designation mark and weight of each item, the number of items, the total weight, and the car initial and number if shipped by rail in carload lots.

##### 2.1.4 Fracture Critical Members (FCM)

Base metal and welding consumables for FCM shall meet the requirements of AWS D1.5, Chapter 12. Charpy V-notch toughness values shall be as required in this reference and ASTM A 709/A 709M and noted on the drawings.

#### 2.2 FABRICATION

##### 2.2.1 Structural Fabrication

Structural steel shapes and plates shall be ASTM A 36/A 36M, unless otherwise noted on the drawings. All structural steel shapes and plates shall be galvanized, unless otherwise noted on drawings. Material must be straight before being laid off or worked. If straightening is necessary it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted except where welding is definitely specified, indicated or otherwise approved. Bends shall be made by approved dies, press brakes or bending rolls. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in a manner that will not impair the original properties of the metal.

Proposed flame cutting of material other than structural steel shall be

subject to approval and shall be indicated on detail drawings. Shearing shall be accurate and all portions of the work shall be neatly finished. Corners shall be square and true unless otherwise shown. Re-entrant cuts shall be filleted to a minimum radius of 3/4 inch unless otherwise approved. Finished members shall be free of twists, bends and open joints. Bolts, nuts and screws shall be tight.

#### 2.2.1.1 Dimensional Tolerances for Structural Work

Dimensions shall be measured by an approved calibrated steel tape of approximately the same temperature as the material being measured. The overall dimensions of an assembled structural unit shall be within the tolerances indicated on the drawings or as specified in the particular section of these specifications for the item of work. Where tolerances are not specified in other sections of these specifications or shown, an allowable variation of 1/32 inch is permissible in the overall length of component members with both ends milled and component members without milled ends shall not deviate from the dimensions shown by not more than 1/16 inch for members 30 feet or less in length and by more than 1/8 inch for members over 30 feet in length.

#### 2.2.1.2 Structural Steel Fabrication

Structural steel may be cut by mechanically guided or hand-guided torches, provided an accurate profile with a surface that is smooth and free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1, Subsection 3.2. Where structural steel is not to be welded, chipping or grinding will not be required except as necessary to remove slag and sharp edges of mechanically guided or hand-guided cuts not exposed to view. Hand-guided cuts which are to be exposed or visible shall be chipped, ground or machined to sound metal. Minimize the amount of field welding. Shop assemble components into largest size possible commensurate with transportation and handling limitations. Shop connections shall be bolted with high strength bolts or welded. Provide a minimum of two 3/4 inch diameter ASTM A 325 high strength bolts for all connections. Provide friction-type connections for all bolted connections. One-sided or other types of eccentric connects not indicated will not be permitted without prior approval.

#### 2.2.1.3 Structural Aluminum Fabrication

Laying out and cutting of aluminum shall be in accordance with the AA SAS-30, Section 6.

### 2.2.2 Welding

#### 2.2.2.1 Welding of Structural Steel

a. Welding Procedures for Structural Steel - Welding procedures for structural steel shall be prequalified as described in AWS D1.1, Subsection 5.1 or shall be qualified by tests as prescribed in AWS D1.1, Section 5. Properly documented evidence of compliance with all requirements of these specifications for previous qualification tests shall establish a welding procedure as prequalified. For welding procedures qualified by tests, the test welding and specimen testing must be witnessed and the test report document signed by the Contracting Officer. Approval of any welding procedure will not relieve the Contractor of the responsibility for producing a finished structure meeting all requirements of these specifications. The

Contractor will be directed or authorized to make any changes in previously approved welding procedures that are deemed necessary or desirable by the Contractor Officer. The Contractor shall submit a complete schedule of welding procedures for each steel structure to be welded. The schedule shall conform to the requirements specified in the provisions AWS D1.1, Sections 2, 3, 4, 7 and 9 and applicable provisions of Section 10. The schedule shall provide detailed procedure specifications and tables or diagrams showing the procedures to be used for each required joint. Welding procedures must include filler metal, preheat, interpass temperature and stress-relief heat treatment requirements. Each welding procedure shall be clearly identified as being prequalified or required to be qualified by tests. Welding procedures must show types and locations of welds designated or in the specifications to receive nondestructive examination. Welding procedures for FCM shall be in accordance with AWS D1.5, Section 12.

b. Welding Process - Welding of structural steel shall be by an electric arc welding process using a method which excludes the atmosphere from the molten metal and shall conform to the applicable provisions of AWS D1.1, Sections 1 thru 7, 9, 10 and 11. Welding shall be such as to minimize residual stresses, distortion and shrinkage. Welding processes for FCM shall be in accordance with AWS D1.5, Section 12.

c. Welding Technique

(1) Filler Metal - The electrode, electrode-flux combination and grade of weld metal shall conform to the appropriate AWS specification for the base metal and welding process being used or shall be as shown where a specific choice of AWS specification allowables is required. The AWS designation of the electrodes to be used shall be included in the schedule of welding procedures. Only low hydrogen electrodes shall be used for manual shielded metal-arc welding regardless of the thickness of the steel. A controlled temperature storage oven shall be used at the job site as prescribed by AWS D1.1, Subsection 4.5 to maintain low moisture of low hydrogen electrodes. Filler metal for FCM shall be in accordance with AWS D1.5, Section 12.

(2) Preheat and Interpass Temperature - Preheating shall be performed as required by AWS D1.1, Subsection 4.2 and 4.3 or as otherwise specified except that the temperature of the base metal shall be at least 70 degrees F. The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air. Preheat and interpass temperatures for FCM shall be in accordance with AWS D1.5, Section 12.

(3) Stress-Relief Heat Treatment - Where stress relief heat treatment is specified or shown, it shall be in accordance with the requirements of AWS D1.1, Subsection 4.4 unless otherwise authorized or directed. Postweld thermal treatment for FCM shall be in accordance with AWS D1.5, Section 12.

d. Workmanship - Workmanship for welding shall be in accordance with AWS D1.1, Section 3 and other applicable requirements of these specifications.

(1) Preparation of Base Metal - Prior to welding the Contractor shall inspect surfaces to be welded to assure compliance with AWS D1.1, Subsection 3.2. Preparation of base metal for FCM shall be in accordance with applicable sections of AWS D1.5.

(2) Temporary Welds - Temporary welds required for fabrication and erection shall be made under the controlled conditions prescribed for permanent work. Temporary welds shall be made using low-hydrogen welding electrodes and by welders qualified for permanent work as specified in these specifications. Preheating for temporary welds shall be as required by AWS D1.1 for permanent welds except that the minimum temperature shall be 120 degrees F in any case. In making temporary welds arcs shall not be struck in other than weld locations. Each temporary weld shall be removed and ground flush with adjacent surfaces after serving its purpose. Temporary welds on FCM shall be in accordance with applicable sections of AWS D1.5.

(3) Tack Welds - Tacks welds that are to be incorporated into the permanent work shall be subject to the same quality requirements as the permanent welds and shall be cleaned and thoroughly fused with permanent welds. Preheating shall be performed as specified above for temporary welds. Multiple-pass tack welds shall have cascaded ends. Defective tack welds shall be removed before permanent welding. Tack welds on FCM shall be in accordance with applicable sections of AWS D1.5.

#### 2.2.2.2 Welding of Steel Castings

Unsound material shall be removed from the surfaces of steel castings to be incorporated into welded connections by chipping, machining, air-arc gouging or grinding. Major connections designed for transfer of stresses shall not be welded if the temperature of the casting is lower than 100 degrees F. Castings containing over 0.35 percent carbon or over 0.75 percent manganese shall be preheated to a temperature not to exceed 450 degrees F and welding shall be accomplished while the castings are maintained at a temperature above 350 degrees F. Welding will not be permitted on castings containing carbon in excess of 0.45 percent except on written authorization. Castings requiring welding repairs after the first annealing and castings involving welding fabrication shall be stress-relieved annealed prior to receiving final machining unless otherwise permitted.

#### 2.2.2.3 Welding of Aluminum

Welding of aluminum shall conform to AA SAS-30 or AWS D1.2, Sections 1 through 7, 9 and 10. The welding process and welding operators shall be prequalified as required by AWS D1.2, Section 5 or AA SAS-30, Subsection 7.2.4 in accordance with the methods described in ASME BPV IX, Section IX. A certified report giving the results of the qualifying tests shall be furnished for approval. A complete schedule of the welding process for each aluminum fabrication to be welded shall be furnished for approval.

#### 2.2.2.4 Welding of Steel Studs

The procedures for welding steel studs to structural steel, including mechanical, workmanship, technique, stud application qualification, production quality control and fabrication and verification inspection procedures shall conform to the requirements of AWS D1.1, Section 7, except

as otherwise specified.

a. Application Qualification for Steel Studs - As a condition of approval of the stud application process, the Contractor shall furnish certified test reports and certification that the studs conform to the requirements of AWS D1.1, Subsections 7.2 and 7.3, certified results of the stud manufacturer's stud base qualification test, and certified results of the stud application qualification test as required by AWS D1.1, Subsection 7.6, except as otherwise specified.

b. Production Quality Control - Quality control for production welding of studs shall conform to the requirements of AWS D1.1, Subsection 7.7, except as otherwise specified. Studs on which pre-production testing is to be performed shall be welded in the same general position as required on production studs (flat, vertical, overhead or sloping). If the reduction of the length of studs becomes less than normal as they are welded, welding shall be stopped immediately and not resumed until the cause has been corrected.

#### 2.2.2.5 Welding of Stainless Steel

Welding of stainless steel shall follow all requirements of AWS D1.6 unless otherwise specified or directed by the Contracting Officer.

#### 2.2.3 Bolted Connections

##### 2.2.3.1 Bolted Structural Steel Connections

Bolts, nuts and washers shall be of the type specified or indicated. All nuts shall be equipped with washers except for high strength bolts. Beveled washers shall be used where bearing faces have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Where the use of high strength bolts is specified or indicated the materials, workmanship and installation shall conform to the applicable provisions of ASTM A 325 or ASTM A 490M.

a. Bolt Holes - Bolt holes shall be accurately located, smooth, perpendicular to the member and cylindrical.

(1) Holes for regular bolts shall be drilled or subdrilled and reamed in the shop and shall not be more than 1/16 inch larger than the diameter of the bolt.

(2) Holes for fitted bolts shall be match-reamed or drilled in the shop. Burrs resulting from reaming shall be removed. The threads of bolts shall be entirely outside of the holes. The body diameter of bolts shall have tolerances as recommended by ASME B4.1 for the class of fit specified. Fitted bolts shall be fitted in reamed holes by selective assembly to provide an LN-2 fit.

(3) Holes for high strength bolts shall have diameters of not more than 1/16 inch larger than bolt diameters. If the thickness of the material is not greater than the diameter of the bolts the holes may be punched. If the thickness of the material is greater than the diameter of the bolts the holes may be drilled full size or subpunched or subdrilled at least 1/8 inch smaller than the diameter of the bolts and then reamed to full size. Poor matching of holes will be cause for rejection. Drifting occurring during assembly shall not distort the metal or enlarge the holes.



Reaming to a larger diameter of the next standard size bolt will be allowed for slight mismatching.

#### 2.2.3.2 Bolted Aluminum Connections

Punching, drilling, reaming and bolting for bolted aluminum connections shall conform to the requirements of AA SAS-30, Section 6.

#### 2.2.4 Riveted Connections

##### 2.2.4.1 Riveted Structural Steel Connections

a. Rivet Holes - Rivet holes shall be accurately spaced, cylindrical and perpendicular to the member. Countersinking shall be true and square with the hole. Rivet holes shall be 1/16 inch larger than the diameter of the rivet. If the thickness of the material is not greater than the diameter of the rivet the holes may be punched full size. If the thickness of the material is greater than the diameter of the rivet the holes shall be drilled full size or subpunched or subdrilled at least 1/8 inch smaller than the diameter of the rivet and then reamed to full size in accordance with the following provisions unless otherwise specified or authorized. For shop connections rivet holes may be drilled full size if the component parts to be riveted are welded, bolted or clamped together before drilling of rivet holes. For field connections the holes required to be subpunched or subdrilled shall be reamed in the shop if the work is assembled and matchmarked in the shop. For field connections not assembled in the shop the holes required to be subpunched or subdrilled shall be reamed in the field after the work has been assembled and bolted together.

(1) Punched Holes - Punching shall be accurate. The diameter of the punch shall be not more than 1/16 inch greater than the diameter of the rivet. The diameter of the die opening shall not be more than 1/16 inch greater than the diameter of the punch. Holes shall be clean cut without torn or ragged edges.

(2) Reamed and Drilled Holes - Reaming and final drilling shall be done with the component parts of the member assembled and firmly fastened together. Drilling shall be done with twist drills. Reaming shall be done with short taper reamers having not less than four flutes. Reamed holes shall be made smooth by the reamer touching the entire circumference of the hole. Outside burrs on reamed holes shall be removed to the extent of making a 1/16 inch chamfer.

(3) Accuracy of Punched and Drilled Holes - The accuracy of holes punched or drilled full size shall be such that for assembled components with a group of contiguous holes in the same plane 75 percent of the holes shall admit a rod equal to the diameter of the cold rivet at right angles to the plane of the connection. The accuracy of holes required to be reamed or drilled after assembly shall be such that any group of contiguous holes in the same plane shall show no offset greater than 1/32 inch between adjacent thicknesses of metal. Drifting to enlarge holes will not be allowed. Poor matching of holes will be cause for rejection. Reaming to a larger diameter for the next standard size rivet will be allowed for slight mismatching.

b. Driving Rivets - Components to be riveted shall have all parts well

pinned and firmly drawn together with bolts before riveting is commenced. Rivets shall be heated uniformly to a light cherry red color at a temperature not over 1950 degrees F in a gas, oil or electric furnace constructed so that it can be adjusted to the proper temperature except that an approved coal or coke furnace may be used for heating field rivets. Rivets shall not be driven after their temperature falls below 1000 degrees F. When heated and ready for driving rivets shall be free from slag, scale and adhesive materials. Rivets shall be hot driven with pressure tools. Driven rivets shall completely fill the holes. Rivet heads shall be neatly formed with dies of approved shape and shall be full size, concentric with the rivet hole and in full contact with the member. Loose, burned, badly formed or otherwise defective rivets shall be removed and replaced with care to avoid damage to adjacent metal. Recupping or caulking will not be permitted. Countersunk rivet heads shall be chipped or ground flush with the surface of the plate unless otherwise specified or authorized. Field rivets shall not be painted until they have been inspected and accepted.

#### 2.2.4.2 Riveted Aluminum Connections

Punching, drilling, reaming and riveting for riveted aluminum connections shall conform to the requirements of AA SAS-30, Section 6.

#### 2.2.5 Machine Work

Tolerances, allowances and gauges for metal fits between plain, non-threaded, cylindrical parts shall conform to ASME B4.1 for the class of fit shown or required unless otherwise shown on approved detail drawings. Where fits are not shown they shall be suitable as approved. Tolerances for machine-finished surfaces designated by non-decimal dimensions shall be within 1/64 inch. Sufficient machining stock shall be allowed on placing pads to ensure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. Journal surfaces shall be polished and all surfaces shall be finished with sufficient smoothness and accuracy to ensure proper operation when assembled. Parts entering any machine shall be accurately machined and all like parts shall be interchangeable except that parts assembled together for drilling or reaming of holes or machining will not be required to be interchangeable with like parts. All drilled holes bolts shall be accurately located.

##### 2.2.5.1 Finished Surfaces

Surface finishes indicated or specified shall be in accordance with ASME B46.1. Values of required roughness heights are arithmetical average deviations expressed in microinches. These values are maximum. Lesser degrees will be satisfactory unless otherwise indicated. Compliance with surface requirements shall be determined by sense of feel and visual inspection of the work compared to Roughness Comparison Specimens in accordance with the provisions of ASME B46.1. Values of roughness width and waviness height shall be consistent with the general type of finish specified by roughness height. Where the finish is not indicated or specified it shall be that which is most suitable for the particular surface, provide the class of fit required and be indicated on the detail drawings by a symbol which conforms to ASME B46.1 when machine finishing is provided. Flaws such as scratches, ridges, holes, peaks, cracks or checks which will make the part unsuitable for the intended use will be cause for rejection.

#### 2.2.5.2 Unfinished Surfaces

All work shall be laid out to secure proper matching of adjoining unfinished surfaces unless otherwise directed. Where there is a large discrepancy between adjoining unfinished surfaces they shall be chipped and ground smooth or machined to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts shall be filled in an approved manner.

#### 2.2.6 Miscellaneous Provisions

##### 2.2.6.1 Metallic Coatings

a. Zinc Coatings - Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM A 123. Where zinc coatings are destroyed by cutting, welding or other causes the affected areas shall be regalvanized. Coatings 2 ounces or heavier shall be regalvanized with a suitable low-melting zinc base alloy similar to the recommendations of the American Hot-Dip Galvanizers Association to the thickness and quality specified for the original zinc coating. Coatings less than 2 ounces shall be repaired in accordance with ASTM A 780.

##### 2.2.7 Shop Assembly

Each machinery and structural unit furnished shall be assembled in the shop to determine the correctness of the fabrication and matching of the component parts unless otherwise specified. Tolerances shall not exceed those shown. Each unit assembled shall be closely checked to ensure that all necessary clearances have been provided and that binding does not occur in any moving part. Assembly in the shop shall be in the same position as final installation in the field unless otherwise specified. Assembly and disassembly work shall be performed in the presence of the Contracting Officer unless waived in writing. Errors or defects disclosed shall be immediately remedied by the Contractor without cost to the Government. Before disassembly for shipment each piece of a machinery or structural unit shall be match-marked to facilitate erection in the field. The location of match-marks shall be indicated by circling with a ring of white paint after the shop coat of paint has been applied or as otherwise directed.

#### 2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have required material tests and analyses performed and certified by an approved laboratory to demonstrate that materials are in conformity with the specifications. These tests and analyses shall be performed and certified at the Contractor's expense. Tests, inspections, and verifications shall conform to the requirements of the particular sections of these specifications for the respective items of work unless otherwise specified or authorized. Tests shall be conducted in the presence of the Contracting Officer if so required. The Contractor shall furnish specimens and samples for additional independent tests and analyses upon request by the Contracting Officer. Specimens and samples shall be properly labeled and prepared for shipment.

##### 2.3.1 Nondestructive Testing

When doubt exists as to the soundness of any material part such part may be subjected to any form of nondestructive testing determined by the Contracting Officer. This may include ultrasonic, magnaflux, dye penetrant, x-ray, gamma ray or any other test that will thoroughly investigate the part in question. The cost of such investigation will be borne by the Government. Any defects will be cause for rejection and rejected parts shall be replaced and retested at the Contractor's expense.

#### 2.3.2 Tests of Machinery and Structural Units

The details for tests of machinery and structural units shall conform to the requirements of the particular sections of these specifications covering these items. Each complete machinery and structural unit shall be assembled and tested in the shop in the presence of the Contracting Officer unless otherwise directed. Waiving of tests will not relieve the Contractor of responsibility for any fault in operation, workmanship or material that occurs before the completion of the contract or guarantee. After being installed at the site each complete machinery or structural unit shall be operated through a sufficient number of complete cycles to demonstrate to the satisfaction of the Contracting Officer that it meets the specified operational requirements in all respects.

#### 2.3.3 Inspection of Structural Steel Welding

The Contractor shall maintain an approved inspection system and perform required inspections in accordance with Contract Clause CONTRACTOR INSPECTION SYSTEM. Welding shall be subject to inspection to determine conformance with the requirements of AWS D1.1, the approved welding procedures and provisions stated in other sections of these specifications.

Nondestructive examination of designated welds will be required. Supplemental examination of any joint or coupon cut from any location in any joint may be required. Nondestructive examination on FCM, including procedures, qualifications, and acceptability, shall follow the requirements of AWS D1.5, Section 12.

##### 2.3.3.1 Visual Examination

All visual examination of completed welds shall be cleaned and carefully examined for insufficient throat or leg sizes, cracks, undercutting, overlap, excessive convexity or reinforcement and other surface defects to ensure compliance with the requirements of AWS D1.1, Section 3 and Section 9, Part D.

##### 2.3.3.2 Nondestructive Examination

The nondestructive examination of shop and field welds shall be performed as designated or described in the sections of these specifications covering the particular items of work.

- a. Testing Agency - The nondestructive examination of welds and the evaluation of examination tests as to the acceptability of the welds shall be performed by a testing agency adequately equipped and competent to perform such services or by the Contractor using suitable equipment and qualified personnel. In either case written approval of the examination procedures is required and the examination tests shall be made in the presence of the Contracting Officer. The evaluation of examination tests shall be subject to the approval and all records shall become the property of the Government.

b. Examination Procedures - Examination procedures shall conform to the following requirements.

(1) Ultrasonic Testing - Making, evaluating and reporting ultrasonic testing of welds shall conform to the requirements of AWS D1.1, Section 6, Part C. The ultrasonic equipment shall be capable of making a permanent record of the test indications. A record shall be made of each weld tested.

(2) Radiographic Testing - Making, evaluating and reporting radiographic testing of welds shall conform to the requirements of AWS D1.1, Section 6, Part B.

(3) Magnetic Particle Inspection - Magnetic particle inspection of welds shall conform to the applicable provisions of ASTM E 709.

(4) Dye Penetrant Inspection - Dye penetrant inspection of welds shall conform to the applicable provisions of ASTM E 165.

c. Acceptability of Welds - Welds shall be unacceptable if shown to have defects prohibited by AWS D1.1, Subsection 9.25 or possess any degree of incomplete fusion, inadequate penetration or undercutting.

d. Welds to be Subject to Nondestructive Examination - All welds on FCM require nondestructive examination. All welds shall be examined by visual inspection and magnetic-particle testing. All butt joints shall be examined by both radiographic and ultrasonic testing. All other groove welds will be tested by ultrasonic testing.

#### 2.3.3.3 Test Coupons

The Government reserves the right to require the Contractor to remove coupons from completed work when doubt as to soundness cannot be resolved by nondestructive examination. Should tests of any two coupons cut from the work of any welder show strengths less than that specified for the base metal it will be considered evidence of negligence or incompetence and such welder shall be removed from the work. When coupons are removed from any part of a structure the members cut shall be repaired in a neat manner with joints of the proper type to develop the full strength of the members. Repaired joints shall be peened as approved or directed to relieve residual stress. The expense for removing and testing coupons, repairing cut members and the nondestructive examination of repairs shall be borne by the Government or the Contractor in accordance with the Contract Clauses INSPECTION AND ACCEPTANCE.

#### 2.3.3.4 Supplemental Examination

When the soundness of any weld is suspected of being deficient due to faulty welding or stresses that might occur during shipment or erection the Government reserves the right to perform nondestructive supplemental examinations before final acceptance. The cost of such inspection will be borne by the Government.

#### 2.3.4 Structural Steel Welding Repairs

Defective welds in the structural steel welding repairs shall be repaired in accordance with AWS D1.1, Subsection 3.7. Defective weld metal shall be removed to sound metal by use of air carbon-arc or oxygen gouging. Oxygen

gouging shall not be used on ASTM A 514/A 514M steel. The surfaces shall be thoroughly cleaned before welding. Welds that have been repaired shall be retested by the same methods used in the original inspection. Except for the repair of members cut to remove test coupons and found to have acceptable welds costs of repairs and retesting shall be borne by the Contractor.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

All parts to be installed shall be thoroughly cleaned. Packing compounds, rust, dirt, grit and other foreign matter shall be removed. Holes and grooves for lubrication shall be cleaned. Enclosed chambers or passages shall be examined to make sure that they are free from damaging materials. Where units or items are shipped as assemblies they will be inspected prior to installation. Disassembly, cleaning and lubrication will not be required except where necessary to place the assembly in a clean and properly lubricated condition. Pipe wrenches, cold chisels or other tools likely to cause damage to the surfaces of rods, nuts or other parts shall not be used for assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly but care shall be taken not to overstress the threads. When a half nut is used for locking a full nut the half nut shall be placed first and followed by the full nut. Threads of all bolts except high strength bolts, nuts and screws shall be lubricated with an approved lubricant before assembly. Threads of corrosion-resisting steel bolts and nuts shall be coated with an approved antigalling compound. Driving and drifting bolts or keys will not be permitted.

##### 3.1.1 Alignment and Setting

Each machinery or structural unit shall be accurately aligned by the use of steel shims or other approved methods so that no binding in any moving parts or distortion of any member occurs before it is fastened in place. The alignment of all parts with respect to each other shall be true within the respective tolerances required. Machines shall be set true to the elevations shown.

##### 3.1.2 Blocking and Wedges

All blocking and wedges used during installation for the support of parts to be grouted in foundations shall be removed before final grouting unless otherwise directed. Blocking and wedges left in the foundations with approval shall be of steel or iron.

#### 3.2 PROTECTION OF FINISHED WORK

##### 3.2.1 Machined Surfaces

Machined surfaces shall be thoroughly cleaned of foreign matter. All finished surfaces shall be protected by suitable means. Unassembled pins and bolts shall be oiled and wrapped with moisture resistant paper or protected by other approved means. Finished surfaces of ferrous metals to be in bolted contact shall be washed with an approved rust inhibitor and coated with an approved rust resisting compound for temporary protection during fabrication, shipping and storage periods. Finished surfaces of metals which shall be exposed after installation except corrosion resisting steel or nonferrous metals shall be painted.

### 3.2.2 Aluminum

Aluminum that shall be in contact with grout or concrete shall be protected from galvanic or corrosive action by being given a coat of zinc-chromate primer and a coat of aluminum paint. Aluminum in contact with structural steel shall be protected against galvanic or corrosive action by being given a coat of zinc-chromate primer and a coat of aluminum paint. The zinc-chromate primer shall conform to SAE AMS 3110. The aluminum paint shall consist of a aluminum paste conforming to ASTM D 962, spar varnish conforming to SAE AMS 3132 and thinner compatible with the varnish. The aluminum paint shall be field mixed in proportion of 2 pounds of paste, not more than one gallon of spar varnish and not more than one pint of thinner.

### 3.3 TESTS

#### 3.3.1 Workmanship

Workmanship shall be of the highest grade and in accordance with the best modern practices to conform with the specifications for the item of work being furnished.

#### 3.3.2 Production Welding

Production welding shall conform to the requirements of AWS D1.1, AWS D1.2, or AWS D1.5 as applicable. Studs on which pre-production testing is to be performed shall be welded in the same general position as required on production items (flat, vertical, overhead or sloping). Test and production stud welding will be subjected to visual examination or inspection. If the reduction of the length of studs becomes less than normal as they are welded, welding shall be stopped immediately and not resumed until the cause has been corrected.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL REQUIREMENTS
- 1.3 SUBMITTALS
- 1.4 STORAGE
- 1.5 WELDING INSPECTOR

PART 2 PRODUCTS

- 2.1 STRUCTURAL STEEL
  - 2.1.1 Carbon Grade Steel
  - 2.1.2 Structural Shapes for Use in Building Framing
- 2.2 STEEL PIPE
- 2.3 HIGH STRENGTH BOLTS AND NUTS
- 2.4 CARBON STEEL BOLTS AND NUTS
- 2.5 NUTS DIMENSIONAL STYLE
- 2.6 WASHERS
- 2.7 EXPANSION BOLTS AND ADHESIVE BOLTS
- 2.8 PAINT

PART 3 EXECUTION

- 3.1 FABRICATION
- 3.2 ERECTION
  - 3.2.1 Structural Connections
  - 3.2.2 Base Plates and Bearing Plates
  - 3.2.3 Field Priming
  - 3.2.4 Expansion Bolts and Adhesive Bolts
- 3.3 WELDING

-- End of Section Table of Contents --



SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

|                          |   |
|--------------------------|---|
| AISC FCD                 | (1995a) Quality Certification Program Description   |
| AISC ASD Manual          | (1989) Manual of Steel Construction Allowable Stress Design   |
| AISC ASD/LRFD Vol II     | (1992) Manual of Steel Construction Vol II: Connections   |
| AISC Design Guide No. 10 | (1989) Erection Bracing of Low-Rise Structural Steel Frames   |
| AISC LRFD Vol II         | (1995) Manual of Steel Construction Load & Resistance Factor Design, Vol II: Structural Members, Specifications & Codes |
| AISC Pub No. S303        | (1992) Code of Standard Practice for Steel Buildings and Bridges  |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                 |   |
|-----------------|---|
| ASTM A 6/A 6M   | (2000) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling  |
| ASTM A 36/A 36M | (1997a) Carbon Structural Steel   |
| ASTM A 53       | (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless                     |
| ASTM A 307      | (1997) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength                                |
| ASTM A 325M     | (1997) High-Strength Bolts for Structural Steel Joints (Metric)                                 |
| ASTM A 490M     | (1993) High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric) |

## Grand Forks Phase 2 Levees

|                   |   |
|-------------------|---|
| ASTM A 563M       | (1997) Carbon and Alloy Steel Nuts (Metric)                                     |
| ASTM A 572/A 572M | (1999; Rev B) High-Strength Low-Alloy<br>Columbium-Vanadium of Structural Steel |
| ASTM A 992/A 992M | (1998e1) Steel for Structural Shapes For<br>Use in Building Framing             |
| ASTM F 593        | (1998) Stainless Steel Bolts, Hex Cap<br>Screws, and Studs                      |
| ASTM F 844        | (1998) Washers, Steel, Plain (Flat),<br>Unhardened for General Use              |

### ASME INTERNATIONAL (ASME)

|            |  |
|------------|--|
| ASME B46.1 | (1995) Surface Texture (Surface Roughness,<br>Waviness, and Lay) |
|------------|--|

### AMERICAN WELDING SOCIETY (AWS)

|          |  |
|----------|--|
| AWS A2.4 | (1998) Standard Symbols for Welding,<br>Brazing and Nondestructive Examination |
| AWS D1.1 | (2000) Structural Welding Code - Steel   |

### THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

|               |  |
|---------------|--|
| SSPC Paint 25 | (1991) Red Iron Oxide, Zinc Oxide, Raw<br>Linseed Oil and Alkyd Primer (Without Lead<br>and Chromate Pigments) |
|---------------|--|

## 1.2 GENERAL REQUIREMENTS

Structural steel fabrication and erection shall be performed by an organization experienced in structural steel work of equivalent magnitude. The Contractor shall be responsible for correctness of detailing, fabrication, and for the correct fitting of structural members. Connections, for any part of the structure not shown on the contract drawings, shall be considered simple shear connections and shall be designed and detailed in accordance with pertinent provisions of AISC ASD Manual and AISC LRFD Vol II. Substitution of sections or modification of connection details will not be accepted unless approved by the Contracting Officer. AISC ASD Manual and AISC ASD/LRFD Vol II shall govern the work. Welding shall be in accordance with AWS D1.1; except that welding for critical applications shall be in accordance with Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS. High-strength bolting shall be in accordance with AISC ASD Manual.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Erection; GA

Prior to erection, erection plan of the structural steel framing describing all necessary temporary supports, including the sequence of installation and removal.

Welding; GA

WPS not prequalified.

Welding; GA

WPS prequalified.

#### SD-04 Drawings

Structural Steel System; GA  
Structural Connections; GA

Shop and erection details including members with their connections not shown on the contract drawings. Welds shall be indicated by standard welding symbols in accordance with AWS A2.4.

#### SD-13 Certificates

Mill Test Reports; GA

Certified copies of mill test reports for structural steel, structural bolts, nuts, washers and other related structural steel items, including attesting that the structural steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified, prior to the installation.

Welder Qualifications; GA

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.1.

Welding Inspector; GA

Welding Inspector qualifications.

Fabrication; GA

A copy of the AISC certificate indicating that the fabrication plant meets the specified structural steelwork category.

#### SD-14 Samples

High Strength Bolts and Nuts; GA  
Carbon Steel Bolts and Nuts; GA  
Nuts Dimensional Style; GA  
Washers; GA  
Expansion Bolts and Adhesive Bolts; GA

Random samples of bolts, nuts, washers, and anchor bolts as delivered to the job site if requested, taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

### 1.4 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

#### 1.5 WELDING INSPECTOR

Welding Inspector qualifications shall be in accordance with AWS D1.1

### PART 2 PRODUCTS

#### 2.1 STRUCTURAL STEEL

##### 2.1.1 Carbon Grade Steel

Carbon grade steel shall conform to ASTM A 36/A 36M, unless otherwise noted on drawings. All carbon grade steel shall be galvanized unless noted on drawings. Where Grade 50 steel is used, carbon grade steel shall conform to ASTM A 572/A 572M.

##### 2.1.2 Structural Shapes for Use in Building Framing

Wide flange shapes in accordance with ASTM A 992/A 992M shall be used where indicated on the drawings.

#### 2.2 STEEL PIPE

Steel pipe shall conform to ASTM A 53, Grade B.

#### 2.3 HIGH STRENGTH BOLTS AND NUTS

High strength bolts shall conform to ASTM A 325M, Type 1 with carbon steel nuts conforming to ASTM A 563M, Grade C or ASTM A 325M, Type 3 with carbon steel nuts conforming to ASTM A 563M, Grade C3.

#### 2.4 CARBON STEEL BOLTS AND NUTS

Carbon steel bolts shall conform to ASTM A 307, Grade A with carbon steel nuts conforming to ASTM A 563M, Grade A.

#### 2.5 NUTS DIMENSIONAL STYLE

Carbon steel nuts shall be Heavy Hex style when used with ASTM A 307 bolts or Heavy Hex style when used with ASTM A 325M or ASTM A 490M bolts.

#### 2.6 WASHERS

Plain washers shall conform to ASTM F 844.

#### 2.7 EXPANSION BOLTS AND ADHESIVE BOLTS

Material: ASTM F 593 stainless steel, Type 304 or 316. Provide Type 316 unless noted otherwise. Provide minimum edge distance cover and spacing as recommended by manufacturer, or as indicated on drawings whichever is larger. Depth of embedment: minimum embedment as recommended by manufacturer or 9 diameters of bolt, whichever is larger. Notify Contracting Officer if required depth of embedment cannot be achieved at a particular bolt location. Follow manufacturer's recommendations for installation and torque.

Submit manufacturer's load test data to verify at least the bolt capacities at the following embedment depths: (Data must be based on actual tests performed in unreinforced mass concrete of not more than 4000 psi compressive strength. Capacity must be at a concrete temperature of at least 130 degrees F.)

| BOLT<br>DIAMETER (IN) | MINIMUM<br>EMBEDMENT (IN) | MINIMUM ULTIMATE<br>TENSION CAPACITY (KIP) |
|-----------------------|---------------------------|--|
| 1/2                   | 4-1/2                     | 8.1  |
| 5/8                   | 5-5/8                     | 11.4                                       |
| 3/4                   | 6-3/4                     | 15.4                                       |
| 7/8                   | 7-7/8                     | 20.1                                       |
| 1                     | 9                         | 24.7                                       |
| 1-1/4                 | 11-1/4                    | 34.3                                       |

## 2.8 PAINT

Paint shall conform to SSPC Paint 25.

## PART 3 EXECUTION

### 3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC ASD Manual. Fabrication and assembly shall be done in the shop to the greatest extent possible. The fabricating plant shall be certified under the AISC. Compression joints depending on contact bearing shall have a surface roughness not in excess of 500 micro inches as determined by ASME B46.1, and ends shall be square within the tolerances for milled ends specified in ASTM A 6/A 6M. Structural steelwork, except surfaces of steel to be encased in concrete, surfaces to be field welded, surfaces to be fireproofed, and contact surfaces of friction-type high-strength bolted connections shall be prepared for painting in accordance with endorsement "P" of AISC FCD and primed with the specified paint.

### 3.2 ERECTION

- a: Erection of structural steel, except as indicated in item b. below, shall be in accordance with the applicable provisions of AISC ASD Manual. Erection plan shall be reviewed, stamped and sealed by a structural engineer licensed by the state in which the project is located.
- b. For low-rise structural steel buildings (60 feet tall or less and a maximum of 2 stories), the erection plan shall conform to AISC Pub No. S303 and the structure shall be erected in accordance with AISC Design Guide No. 10.

#### 3.2.1 Structural Connections

bolts and other connections between the structural steel and foundations shall be provided and shall be properly located and built into connecting work. Field welded structural connections shall be completed before load is applied.

#### 3.2.2 Base Plates and Bearing Plates

Column base plates for columns and bearing plates for beams, girders, and similar members shall be provided. Base plates and bearing plates shall be

provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. The area under the plate shall be damp-packed solidly with bedding mortar, except where nonshrink grout is indicated on the drawings. Bedding mortar and grout shall be as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

### 3.2.3 Field Priming

After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat.

### 3.2.4 Expansion Bolts and Adhesive Bolts

Install in strict accordance with manufacturer's instructions for hole size, hole cleaning, installation, torque requirements substrate temperature and curing. Use only carbide-tipped drilling equipment.

## 3.3 WELDING

The Contractor shall develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Prequalified procedures may be submitted for information only; however, procedures that are not prequalified shall be submitted for approval.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05300

STEEL DECKING

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

- 2.1 DECK UNITS
  - 2.1.1 Roof Deck
  - 2.1.2 Shear Connectors
- 2.2 TOUCH-UP PAINT
- 2.3 ADJUSTING PLATES
- 2.4 CLOSURE PLATES
  - 2.4.1 Closure Plates for Roof Deck
    - 2.4.1.1 Sheet Metal
- 2.5 ACCESSORIES

PART 3 EXECUTION

- 3.1 ERECTION
- 3.2 ATTACHMENTS
- 3.3 HOLES AND OPENINGS
- 3.4 PREPARATION OF FIRE-PROOFED SURFACES

-- End of Section Table of Contents --

SECTION 05300

STEEL DECKING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC ASD Spec (1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI Cold-Formed Mnl (1996) Cold-Formed Steel Design Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 108 (1999) Steel Bars, Carbon, Cold Finished, Standard Quality

ASTM A 611 (1997) Structural Steel (SS), Sheet, Carbon, Cold-Rolled

ASTM A 653/A 653M (1999a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2000) Structural Welding Code - Steel

AWS D1.3 (1998) Structural Welding Code - Sheet Steel

STEEL DECK INSTITUTE (SDI)

SDI Diaphragm Mnl (1987; Amended 1991) Diaphragm Design Manual

SDI Pub No 29 (1995) Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distributio

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The



following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Deck Units; GA

Design computations for the structural properties of the deck units or SDI certification that the units are designed in accordance with SDI specifications.

Attachments; GA

Prior to welding operations, copies of qualified procedures and lists of names and identification symbols of qualified welders and welding operators.

SD-04 Drawings

Deck Units; GA

Accessories; GA

Attachments; GA

Holes and Openings; GA

Drawings shall include type, configuration, structural properties, location, and necessary details of deck units, accessories, and supporting members; size and location of holes to be cut and reinforcement to be provided; location and sequence of welded or fastener connections; and the manufacturer's erection instructions.

SD-13 Certificates

Deck Units; GA

Attachments; GA

Manufacturer's certificates attesting that the decking material meets the specified requirements. Manufacturer's certificate attesting that the operators are authorized to use the low-velocity piston tool.

SD-14 Samples

Deck Units; GA

Accessories; GA

A 2 sq. ft. sample of the decking material to be used, along with a sample of each of the accessories used. A sample of acoustical material to be used shall be included.

1.3 DELIVERY, STORAGE, AND HANDLING

Deck units shall be delivered to the site in a dry and undamaged condition, stored off the ground with one end elevated, and stored under a weathertight covering permitting good air circulation. Finish of deck units shall be maintained at all times by using touch-up paint whenever necessary to prevent the formation of rust.

PART 2 PRODUCTS

## 2.1 DECK UNITS

Deck units shall conform to SDI Pub No 29. Panels of maximum possible lengths shall be used to minimize end laps. Deck units shall be fabricated in lengths to span 3 or more supports with flush, telescoped, or nested 2 inchlaps at ends, and interlocking, or nested side laps, unless otherwise indicated. Deck with cross-sectional configuration differing from the units indicated may be used, provided that the properties of the proposed units, determined in accordance with AISI Cold-Formed Mnl, are equal to or greater than the properties of the units indicated and that the material will fit the space provided without requiring revisions to adjacent materials or systems.

### 2.1.1 Roof Deck

Deck to receive concrete as a filler shall conform to ASTM A 653/A 653M or ASTM A 611. Deck shall be fabricated of 0.034 inch design thickness or thicker steel and shall be galvanized.

### 2.1.2 Shear Connectors

Shear connectors shall be headed stud type, ASTM A 108, Grade 1015 or 1020, cold finished carbon steel with dimensions complying with AISC ASD Spec.

## 2.2 TOUCH-UP PAINT

Touch-up paint for galvanized units shall be an approved galvanizing repair paint. Finish of deck units and accessories shall be maintained by using touch-up paint whenever necessary to prevent the formation of rust.

## 2.3 ADJUSTING PLATES

Adjusting plates or segments of deck units shall be provided in locations too narrow to accommodate full-size units. As far as practical, the plates shall be the same thickness and configuration as the deck units.

## 2.4 CLOSURE PLATES

### 2.4.1 Closure Plates for Roof Deck

The concrete shall be supported and retained at each level. Provide edge closures at all edges of the slab of sufficient strength and stiffness to support the wet concrete. Metal closures shall be provided for all openings in steel deck 1/4 inch and over.

#### 2.4.1.1 Sheet Metal

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

## 2.5 ACCESSORIES

The manufacturer's standard accessories shall be furnished as necessary to complete the deck installation. Metal accessories shall be of the same material as the deck and have minimum design thickness as follows: saddles, 0.0474 inch; cant strip, 0.0295 inch; other metal accessories, 0.0358 inch; unless otherwise indicated. Accessories shall include but not be limited to saddles, cant strips, butt cover plates, underlapping sleeves, and ridge

and valley plates.

## PART 3 EXECUTION

### 3.1 ERECTION

Erection of deck and accessories shall be in accordance with SDI Pub No 29 or SDI Diaphragm Mnl and the approved detail drawings. Damaged deck and accessories including material which is permanently stained or contaminated, with burned holes or deformed shall not be installed. The deck units shall be placed on secure supports, properly adjusted, and aligned at right angles to supports before being permanently secured in place. The deck shall not be filled with concrete, used for storage or as a working platform until the units have been secured in position. Loads shall be distributed by appropriate means to prevent damage during construction and to the completed assembly. The maximum uniform distributed storage load shall not exceed the design live load. There shall be no loads suspended directly from the steel deck. Acoustical material shall be neatly fitted into the rib voids.

### 3.2 ATTACHMENTS

All fasteners shall be installed in accordance with the manufacturer's recommended procedure, except as otherwise specified. The deck units shall be welded with nominal 5/8 inch diameter puddle welds or fastened with screws, powder-actuated fasteners or pneumatically driven fasteners to supports as indicated on the design drawings and in accordance with requirements of SDI Pub No 29. All welding of steel deck shall be in accordance with AWS D1.3 using methods and electrodes as recommended by the manufacturer of the steel deck being used. Welds shall be made only by operators previously qualified by tests prescribed in AWS D1.3 to perform the type of work required. Welding washers shall not be used at the connections of the deck to supports. Welding washers shall not be used at sidelaps. Holes and similar defects will not be acceptable. Deck ends shall be lapped 2 inches. All partial or segments of deck units shall be attached to structural supports in accordance with Section 2.5 of SDI Diaphragm Mnl. Powder-actuated fasteners shall be driven with a low-velocity piston tool by an operator authorized by the manufacturer of the piston tool. Pneumatically driven fasteners shall be driven with a low-velocity fastening tool and shall comply with the manufacturer's recommendations. Shear connectors shall be attached as shown and shall be welded as per AWS D1.1 through the steel deck to the steel member.

### 3.3 HOLES AND OPENINGS

All holes and openings required shall be coordinated with the drawings, specifications, and other trades. Holes and openings shall be drilled or cut, reinforced and framed as indicated on the drawings or described in the specifications and as required for rigidity and load capacity. Holes and openings less than 6 inches across require no reinforcement. Holes and openings 6 to 12 inches across shall be reinforced by 0.0474 inch thick steel sheet at least 12 inches wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of 6 inches on center. Holes and openings larger than 12 inches shall be reinforced by steel angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Steel angles shall be installed perpendicular to the deck ribs and shall be fastened to the angles perpendicular to the steel joists.

#### 3.4 PREPARATION OF FIRE-PROOFED SURFACES

Deck surfaces, both composite and noncomposite, which are to receive sprayed-on fireproofing, shall be galvanized and shall be free of all grease, mill oil, paraffin, dirt, salt, and other contaminants which impair adhesion of the fireproofing. Any required cleaning shall be done prior to steel deck installation using a cleaning method that is compatible with the sprayed-on fireproofing.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05500

MISCELLANEOUS METAL

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 GENERAL REQUIREMENTS
- 1.4 DISSIMILAR MATERIALS
- 1.5 WORKMANSHIP
- 1.6 ANCHORAGE
- 1.7 ALUMINUM FINISHES
- 1.8 SHOP PAINTING

PART 2 PRODUCTS

- 2.1 PIPE GUARDS
- 2.2 FLOOR GRATINGS AND FRAMES
- 2.3 STEEL GRATING
- 2.4 HANDRAILS
  - 2.4.1 Steel Handrails, Including Carbon Steel Inserts
- 2.5 MANHOLE STEPS AND COVERS
- 2.6 STEEL CHECKERED PLATE
- 2.7 MISCELLANEOUS
- 2.8 FALL RESTRAINT SYSTEM
- 2.9 STEEL LADDER
- 2.10 TRENCH COVERS, FRAMES, AND LINERS
- 2.11 ALUMINUM HATCH
- 2.12 TRASH RACKS
- 2.13 PUMP GUIDE RAILS

PART 3 EXECUTION

- 3.1 GENERAL INSTALLATION REQUIREMENTS
- 3.2 INSTALLATION OF STEEL GRATING
- 3.3 INSTALLATION OF PIPE GUARDS
- 3.4 ATTACHMENT OF HANDRAILS
  - 3.4.1 Installation of Steel Handrails
- 3.5 INSTALLATION OF MANHOLE STEPS AND COVERS
- 3.6 TRENCH FRAMES AND COVERS
- 3.7 INSTALLATION OF FALL RESTRAINT SYSTEM
- 3.8 INSTALLATION OF ALUMINUM HATCH
- 3.9 INSTALLATION OF TRASH RACKS
- 3.10 INSTALLATION OF PUMP GUIDE RAILS

-- End of Section Table of Contents --

SECTION 05500

MISCELLANEOUS METAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45 (1997) Designation System for Aluminum Finishes

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI MBG 531 (1993) Metal Bar Grating Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M (1997a) Carbon Structural Steel

ASTM A 48 (2000) Gray Iron Castings

ASTM A 53 (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 123/A 123M (2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 325 (1994) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 653/A 653M (1999a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 786 (2000) Rolled Steel Floor Plates

ASTM A 924/A 924M (1999) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM C 478 (1997) Precast Reinforced Concrete Manhole Sections

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2000) Structural Welding Code - Steel

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-344 (Rev B) Lacquer, Clear Gloss, Exterior,  
Interior

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531 (1994) Metal Bar Grating Manual

NAAMM MBG 532 (1994) Heavy Duty Metal Bar Grating Manual

US DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH  
ADMINISTRATION (OSHA)

OSHA 20 CFR1910 OSHA Safety and Health Standard for  
General Industry

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Miscellaneous Metal Items; GA

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates.

SD-14 Samples

Miscellaneous Metal Items; FIO.

Samples shall be full size, taken from manufacturer's stock, and shall be complete as required for installation in the structure. Samples may be installed in the work, provided each sample is clearly identified and its location recorded.

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M, ASTM A 653/A 653M, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

#### 1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

#### 1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

#### 1.7 ALUMINUM FINISHES

Unless otherwise specified, aluminum items shall have standard mill finish. The thickness of the coating shall be not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF-45. Items to be anodized shall receive a polished satin finish. Aluminum surfaces to be in contact with plaster or concrete during construction shall be protected with a field coat conforming to CID A-A-344. Any Government-supplied aluminum to be embedded in concrete shall be field coated in accordance with CID A-A-344.

#### 1.8 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

### PART 2 PRODUCTS

#### 2.1 PIPE GUARDS

Pipe guards shall be heavy duty steel pipe conforming to ASTM A 53, Type E or S, weight STD, black finish.

#### 2.2 FLOOR GRATINGS AND FRAMES



Carbon steel grating shall be designed in accordance with NAAMM MBG 531 or NAAMM MBG 532 to meet the indicated load requirements. Edges shall be banded with bars 1/4 inch less in height than bearing bars for grating sizes above 3/4 inch. Banding bars shall be flush with the top of bearing grating. Frames shall be of welded steel construction finished to match the grating. Floor gratings and frames shall be galvanized after fabrication.

## 2.3 STEEL GRATING

ANSI MBG 531. Minimum depth: 1-1/4 inch. Minimum rectangular bearing bar thickness: 3/16 inch. Minimum 2-3/8 inch on center spacing. Design live load shall not be less than 100 psf plus a concentrated load of 300 pounds with a maximum deflection of 1/300 of span under a superimposed live load of 100 psf or HS-20 loading where shown on the drawings. Cross bars shall be welded, swagged or pressure locked to bearing beam, maximum spacing 4 inch/oc. Top edges of bars shall be serrated or grooved. Individual grating sections shall not be wider than 3 feet and not more than 100 pounds. Finish: Galvanized. Clips and bolts shall be stainless steel or galvanized. Seat angles shall be galvanized steel. Ends and perimeter edges shall be banded. Openings through grating shall be reinforced to provide required load carrying capacity and banded with 4 inch high toe plate.

Minimize the amount of field welding. Shop-assemble components into largest size possible commensurate with transportation and handling limitations. Shop connections shall be bolted with high-strength bolts or welded. Provide as a minimum, two 3/4 inch diameter, ASTM A 325 high-strength bolts for all bolted connections. Provide friction-type connections for all bolted connections. One-sided or other types of eccentric connections not indicated will not be permitted without prior approval.

## 2.4 HANDRAILS

Handrails shall be designed to resist a concentrated load of 200 pounds in any direction at any point of the top of the rail or 50 pounds per foot applied horizontally at right angles to top of the rail, whichever is more severe.

### 2.4.1 Steel Handrails, Including Carbon Steel Inserts

Steel handrails, including inserts in concrete, shall be steel pipe conforming to ASTM A 53. Steel railings shall be 2 inch nominal size. Railings shall be hot-dip galvanized. Pipe collars shall be galvanized steel.

- a. Joint posts, rail, and corners shall be fabricated by one of the following methods:

- (1) Flush type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8 inch hexagonal recessed-head setscrews.

- (2) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 6 inches long.

(3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

- b. Removable sections, toe-boards, and brackets shall be provided as indicated.

## 2.5 MANHOLE STEPS AND COVERS

Manhole steps shall conform to ASTM C 478 and be made of polypropylene-coated steel. Manhole covers shall conform to ASTM A 48, Class 35. The type used shall be grey cast iron, slab type, with single lid, double-hinges and lifting handle. The installed cover shall be capable of withstanding 1 ton concentrated load. The cover shall come complete with frame, lid, required accessories, have manufacturer's shop finish and have shop-coated assembly.

## 2.6 STEEL CHECKERED PLATE

The material used for steel checkered plate shall conform to ASTM A 786 with a minimum thickness of 1/4 inch. Stiffener angles at checkered plate joints welded to 1 plate and fastened to the other. Provide stiffener angles, bars or other supports to limit deflection to 1/300 of span using a live load of 50 psf as a basis for calculating deflection. The floor sections shall be removable with the weight of each being not be more than 150 pounds. Provide 2 holes, slotted round ends 3/4 inch x 1-1/2 inch for lifting each section of floor plate, ream holes to remove burrs.

## 2.7 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work.

## 2.8 FALL RESTRAINT SYSTEM

The fall restraint system shall contain 1 construction vest-style full body harness with tongue buckle leg straps. The system shall contain 1 Ultra-Lok self-retracting life line. The restraint system shall be provided with 1 self-locking snap hook for connection of self-retracting life line to a tie off adapter. Connectors (hooks, carabiners, D rings, etc) must support a minimum load of 5,000 pounds. Ensure connecting hooks and anchorage are compatible. Anchorages selected for personal restraint system shall be capable of sustaining static loads applied in the directions permitted by personal fall restraint system of at least 5,000 pounds. When more than 1 personal fall restraint system is attached to an anchorage, the anchorage strengths set forth must be multiplied by the number of personal fall restraint systems attached to the anchorage. The fall restraint system shall conform with OSHA 20 CFR1910 and all applicable OSHA requirements.

## 2.9 STEEL LADDER

Steel ladder shall be complete with structural or formed channel stringers, steel plate treads and risers, landings, columns, handrails, and necessary bolts and other fastenings as indicated. Structural steel shall conform to ASTM A 36/A 36M. Stairs and accessories shall be galvanized. Risers on stairs with metal pan treads shall be deformed to form a sanitary cove to retain the tread concrete. Integral nosings shall have braces extended

into the concrete fill. Gratings for treads and landings shall conform to NAAMM MBG 531. Grating treads shall have slip-resistant nosings.

#### 2.10 TRENCH COVERS, FRAMES, AND LINERS

Trench covers shall be designed to meet the indicated load requirements. Trench frames and anchors shall be all welded steel construction designed to match cover. Covers shall have flush drop handles formed of 1/4 inch round stock, and shall be cast-iron grating. Grating opening widths shall not exceed 1 inch. Trench liners shall be cast iron with integral frame for cover.

#### 2.11 ALUMINUM HATCH

Aluminum hatch doors shall have 1/4 inch diamond plate, reinforced with aluminum stiffeners as needed. The hatch door shall open to 90 degrees and lock automatically in position. The hatch shall withstand 150 psf and be equipped with lock and removable handles. The frame shall be made of 1/4 inch extruded aluminum with built-in neoprene cushion and strap anchors. The finish shall be a mill finish, with bituminous coating applied to portions of exterior of frame in contact with concrete.

#### 2.12 TRASH RACKS

Structural steel shall conform to ASTM A 36/A 36M. See drawings for bar sizes, bar spacing and welds. Finish: Galvanized. All connections (anchor rods, nuts, bolts, angles) shall be stainless steel or galvanized, as shown on drawings.

#### 2.13 PUMP GUIDE RAILS

Provide Schedule 40 stainless steel twin guide rails for removal of sump and stormwater pumps. Provide two 3-inch diameter guide rails for each 15,000 gpm stormwater pump; two 3-inch diameter guide rails for each 6,000 gpm stormwater pump; and two 2-inch diameter guide rails for each 1,000 gpm sump pump. Coordinate and provide necessary guide rail length and additional equipment required for complete installation and erection of guide rail system for all Government provided sump and stormwater pumps.

### PART 3 EXECUTION

#### 3.1 GENERAL INSTALLATION REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional procedures as specified.

#### 3.2 INSTALLATION OF STEEL GRATING

Attach grating to end and intermediate supports with grating saddle clips and bolts. Maximum spacing shall be at 2 feet on center with a minimum of 2 per side. Attach individual units of grating together with clips at 2 feet on center maximum with a minimum of 2 clips per side.

#### 3.3 INSTALLATION OF PIPE GUARDS

Pipe guards shall be set vertically in concrete piers. Piers shall be constructed of, and the hollow cores of the pipe filled with, concrete specified in SECTION 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

### 3.4 ATTACHMENT OF HANDRAILS

Toeboards and brackets shall be installed where indicated. Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

#### 3.4.1 Installation of Steel Handrails

Installation shall be by means of pipe sleeves secured to base plates bolted to stringers or structural steel framework. Rail ends shall be secured by steel pipe flanges anchored by expansion shields and bolts.

### 3.5 INSTALLATION OF MANHOLE STEPS AND COVERS

Install manhole steps and cover in strict accordance to manufacturer's specifications. The unit shall be operable upon completion of installation. Locate manhole steps and covers as shown on drawings.

### 3.6 TRENCH FRAMES AND COVERS

Trench frames and covers shall finish flush with the floor.

### 3.7 INSTALLATION OF FALL RESTRAINT SYSTEM

Installation shall be in accordance with manufacturer's recommendations. Where applicable, install in a workmanship manner, plumb and level as required. Install supports and fastening mechanism as needed to provide secure and sturdy system. All welds and bolted connections shall be clear and all sharp and rough areas removed. Field welding of galvanized materials shall be recoated with approved galvanized materials.

### 3.8 INSTALLATION OF ALUMINUM HATCH

Fasten hatch securely in place. Completely assemble hatch with inside-outside operable handles, lifting and hold-open mechanism, hinges, and necessary hardware for complete operation. The unit shall be operable upon completion of installation. Locate hatch where shown on drawings.

### 3.9 INSTALLATION OF TRASH RACKS

Installation of trash racks shall be as shown on drawings.

### 3.10 INSTALLATION OF PUMP GUIDE RAILS

Install twin pump guide rails and complete guide rail system in accordance with manufacturer's recommendations. After installation of guide rail system and installation of pump, test guide rail system in the presence of Contracting Officer by removing and reinstalling each installed sump and stormwater pump.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05510

PIPE AND TUBE RAILINGS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 PERFORMANCE REQUIREMENTS
- 1.3 SUBMITTALS
- 1.4 QUALITY ASSURANCE
- 1.5 PROJECT CONDITIONS

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Steel Shapes
  - 2.1.2 Steel Sheet
  - 2.1.3 Galvanized Steel Sheet
- 2.2 MATERIALS - MISCELLANEOUS
  - 2.2.1 Grout
  - 2.2.2 Concrete
  - 2.2.3 Fasteners
  - 2.2.4 Galvanizing Repair Paint
  - 2.2.5 Concrete Pavers
- 2.3 FABRICATION - GENERAL
  - 2.3.1 Joints and Connections
  - 2.3.2 Welding
  - 2.3.3 Joints Exposed to Weather
  - 2.3.4 Sheet Metal
  - 2.3.5 Anchors
- 2.4 FABRICATION - RAILINGS
- 2.5 FINISHING
  - 2.5.1 Galvanizing
  - 2.5.2 Preparation of Steel for Finishing
  - 2.5.3 Priming
  - 2.5.4 Protection

PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 CLEANING AND TOUCH-UP

-- End of Section Table of Contents --

SECTION 05510

PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |   |
|-------------------|---|
| ASTM A 36/A 36M   | (1997a) Carbon Structural Steel   |
| ASTM A 53         | (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless                                   |
| ASTM A 123        | (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products   |
| ASTM A 307        | (1997) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength  |
| ASTM A 325        | (1994) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength                            |
| ASTM A 500        | (1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes                    |
| ASTM A 563        | (1997) Carbon and Alloy Steel Nuts  |
| ASTM A 569        | (1998) Commercial Steel (CS) Sheet and Strip, Carbon (0.15 Maximum Percent), Hot-Rolled                       |
| ASTM A 570/A 570M | (1998) Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality   |
| ASTM A 611        | (1997) Structural Steel (SS), Sheet, Carbon, Cold-Rolled  |
| ASTM A 653/A 653M | (1999a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process |
| ASTM A 780        | (1993a) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings                                |
| ASTM C 936        | (1996) Solid Concrete Interlocking Paving Units   |

## Grand Forks Phase 2 Levees

ASTM C 1107 (1999) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

### AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2000) Structural Welding Code - Steel

AWS D1.3 (1998) Structural Welding Code - Sheet Steel

### FEDERAL SPECIFICATIONS (FS)

FS-A-A-1922 (1995) Shield, Expansion (Caulking Anchors, Single Lead)

FS-FF-W-84 (1967) Washers, Lock (Spring)

FS-FF-W-92 (1974) Washer, Flat (Plain)

### MILITARY SPECIFICATIONS (MS)

MS MIL P-21035 (Rev B, CN 1) Paint High Zinc Dust Content, Galvanizing Repair (Metric)

### THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 20 (1991) Zinc-Rich Primers (Type I - "Inorganic" and Type II - "Organic")

SSPC PA 1 (1991) Shop, Field, and Maintenance Painting

SSPC SP 1 (1982) Solvent Cleaning

SSPC SP 3 (1995) Power Tool Cleaning

SSPC SP 7 (1994) Brush-Off Blast Cleaning

SSPC SP 8 (1982) Picklin

## 1.2 PERFORMANCE REQUIREMENTS

Member sizes indicated are minimum; provide sizes required.

Structural performance of handrails and railings:

a. Top Rail of Guards and Handrails: Concentrated load of 200 lbf applied at any point and in any direction. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward. Concentrated and uniform loads above need not be assumed to act concurrently.

b. Infill area of guards: Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1 square foot at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Manufacturer's specifications and installation instructions; FIO.

All manufactured products used in fabrications.

Structural design calculations; FIO

Structural design calculations prepared, signed and sealed by an engineer licensed in the State of North Dakota. Include vibration analysis.

SD-04 Drawings

Materials; GA

For each fabricated item, show the following:

- a. Plans and elevations.
- b. Jointing and connections. Indicate welded connections using standard AWS symbols; indicate net weld length.
- c. Profiles of sections and reinforcing.
- d. Fasteners and anchors.
- e. Accessories.
- f. Location of each finish.

SD-14 Samples

Materials; GA

Samples of products and materials when requested.

1.4 QUALITY ASSURANCE

Provide design sealed by a professional engineer registered in the State of North Dakota.

1.5 PROJECT CONDITIONS

Coordination with masonry and concrete work: Where fabricated items or their anchors are to be embedded into concrete and masonry work, deliver such items to those performing the installation, together with coordination drawings and installation instructions.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Steel Shapes



Plates, bars, angles, channels and H-sections shall conform to ASTM A 36/A 36M. Grating bars shall conform to ASTM A 36/A 36M or ASTM A 569. Galvanizing shall be hot-dip galvanized after fabrication in accordance with ASTM A 123. Pipe shall conform to ASTM A 53, Grade B. Tube shall be cold-formed in conformance with ASTM A 500, hot-dip galvanized after fabrication in accordance with ASTM A 123.

#### 2.1.2 Steel Sheet

For structural uses: Hot-rolled, ASTM A 570/A 570M; cold rolled, ASTM A 611.

#### 2.1.3 Galvanized Steel Sheet

For structural uses: ASTM A 653/A 653M. Galvanizing: In accordance with ASTM A 653/A 653M, G90, unless otherwise indicated.

### 2.2 MATERIALS - MISCELLANEOUS

#### 2.2.1 Grout

Nonmettalic, noncorrodible, nonshrink, factory blended and packaged; complying with ASTM C 1107; recommended by manufacturer for exterior use.

#### 2.2.2 Concrete

As specified in Division 3.

#### 2.2.3 Fasteners

Use fasteners suitable for the material being fastened and for the type of connection required. For exterior use: Nonferrous stainless steel, zinc coated or cadmium plated. Use fasteners of same material as items being fastened unless otherwise indicated. Bolts and studs: ASTM A 307 except where ASTM A 325 indicated on drawings. Nuts: ASTM A 563. Plain Washers: FS-FF-W-92. Lock Washers: FS-FF-W-84. Expansion Shields: FS-A-A-1922.

#### 2.2.4 Galvanizing Repair Paint

Zinc dust paint complying with SSPC Paint 20 or MS MIL P-21035B, Type I or II.

#### 2.2.5 Concrete Pavers

Solid, interlocking paving units, ASTM C 936, made from normal-weight agTT-P-664, or equivalent.

### 2.3 FABRICATION - GENERAL

Fabricate and shop-assemble in largest practical sections for delivery to site. Prepare and reinforce fabrications as required to receive applied items. Smooth off exposed edges and projections that are within reach and would otherwise be uncom-fortable to touch.

#### 2.3.1 Joints and Connections

Make exposed joints and connections tight, flush, and neat. All joints and connections shall be welded, except where otherwise indicated. Exposed fasteners may be used only for joints and connections specifically

indicated as requiring exposed fasteners.

#### 2.3.2 Welding

Provide continuous welds at corners and seams. Structural shapes shall comply with AWS D1.1 recommendations. Sheet metal shall comply with AWS D1.3 recommendations. Grind flush and smooth welds exposed to view.

#### 2.3.3 Joints Exposed to Weather

Fabricate to keep water out, or provide adequate drainage of water that penetrates.

#### 2.3.4 Sheet Metal

Bend corners to smallest possible radius.

#### 2.3.5 Anchors

Fabricate to suit anchors indicated; use anchors of same material and finish as item except where specifically indicated otherwise.

### 2.4 FABRICATION - RAILINGS

Construct as indicated. Round pipe/tube shall be nominal pipe sizes (NPS) shown on drawings. Connections shall be welded and ground. Welding: Fill joints completely and grind off flush. Close exposed ends of hollow members with prefabricated fittings or with 3/16-inch-thick plate fully welded. Bending of members: Use jigs to make each similar configuration the same; make neat bends without other deformation. Close exposed open ends of members using same material as used in member.

### 2.5 FINISHING

#### 2.5.1 Galvanizing

Hot-dip galvanize after fabrication in accordance with ASTM A 653/A 653M.

#### 2.5.2 Preparation of Steel for Finishing

Prepare by removing loose mill scale, loose corrosion products, dirt, oil and grease. Use pickling, blast cleaning, or power tool cleaning, as required. Perform pickling in accordance with SSPC SP 8. Perform blast cleaning in accordance with SSPC SP 7, minimum. Perform power tool cleaning in accordance with SSPC SP 3. Grind off projections on exposed surfaces and fill holes and depressions. Solvent cleaning in accordance with SSPC SP 1.

#### 2.5.3 Priming

Apply primer in shop immediately after preparation; comply with SSPC PA 1. Apply extra coat to corners, welds, edges, and fasteners. Shop prime all steel members of fabrications indicated to be factory-primed for painting. Exceptions are the following:

- a. Surfaces to be fieldwelded.
- b. Surfaces in direct contact bond with concrete.

- c. Exterior railing (hot-dip galvanized).

#### 2.5.4 Protection

Protect finishes on exposed surfaces from damage by using temporary protective coverings. Where corrosion occurs prior to application of finish coating, clean corroded areas and re-apply shop coatings. Touch-up damaged factory finishes as recommended by fabricator.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Install items in correct location, plumb and level, without rack or warp. Provide temporary supports and bracing as required. Anchor to substrates and bracing as required. Perform all field fabrication required for installation. Fit joints tightly. Weld joints as indicated. Weld in accordance with AWS code. Grind exposed welds flush and smooth. Do not cut or weld items galvanized after fabrication. Fill steel pans with concrete, as indicated; make surface level.

#### 3.2 CLEANING AND TOUCH-UP

Touch up damage to galvanized surfaces using methods and materials as follows:

- a. Items to Receive Paint Finish: ASTM A 780, any method.
- b. Items Left Exposed (Mill Galvanized Finish): ASTM A 780, Annex A1 ("hot stick" method).

Touch up shop painting immediately after erection. Clean field welds, bolted joints and areas where primer is damaged. Paint with material used for shop painting, minimum 2 mils dry film thickness.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05615

STOPLOGS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 QUALIFICATION OF WELDERS AND WELDING OPERATORS
- 1.4 DELIVERY, STORAGE AND HANDLING
  - 1.4.1 Rubber Seals

PART 2 PRODUCTS

- 2.1 DISCHARGE CHAMBER STOPLOGS
  - 2.1.1 Stoplog Panels
  - 2.1.2 MATERIALS
    - 2.1.2.1 Metals
    - 2.1.2.2 Rubber Seals
  - 2.1.3 Manufactured Units
- 2.2 CLOSURE STRUCTURE STOPLOGS
  - 2.2.1 Stoplogs
  - 2.2.2 Stoplog Grooves and Sill
  - 2.2.3 Materials
    - 2.2.3.1 Seal Pads
    - 2.2.3.2 Structural Steel
    - 2.2.3.3 Structural Aluminum
    - 2.2.3.4 Steel Threaded Rod
    - 2.2.3.5 Stainless Steel Threaded Rod
    - 2.2.3.6 Stop Tie-down Straps
    - 2.2.3.7 Welded Shear Studs
    - 2.2.3.8 Bolts
    - 2.2.3.9 Nuts
    - 2.2.3.10 Welds
- 2.3 FABRICATION
  - 2.3.1 Detail Drawings
    - 2.3.1.1 Fabrication Drawings
    - 2.3.1.2 Shop Assembly Drawings
    - 2.3.1.3 Delivery Drawings
    - 2.3.1.4 Field Installation Drawings
  - 2.3.2 Structural Fabrication
  - 2.3.3 Welding
  - 2.3.4 Bolted Connections
  - 2.3.5 Machine Work
  - 2.3.6 Miscellaneous Provisions
  - 2.3.7 Fabrications
    - 2.3.7.1 Stoplogs
    - 2.3.7.2 Stoplog Guides, Grooves, and Sills
    - 2.3.7.3 Miscellaneous Embedded Metals
  - 2.3.8 Seal Assemblies

Grand Forks Phase 2 Levees

2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

2.4.1 Testing of Rubber Seals

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Embedded Metals

3.2 PROTECTION OF FINISHED WORK

3.3 ACCEPTANCE TRIAL OPERATION

-- End of Section Table of Contents --

SECTION 05615

STOPLOGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |  |
|-------------------|--|
| ASTM A 36         | (1997e1) Carbon Structural Steel   |
| ASTM A 276        | (1998b) Stainless Steel Bars and Shapes  |
| ASTM A 325        | (1994) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength   |
| ASTM A 449        | (1993) Quenched and Tempered Steel Bolts and Studs   |
| ASTM A 563        | (1997) Carbon and Alloy Steel Nuts   |
| ASTM A 572        | (1992b) High-Strength Low-Alloy Columbian-Vanadium Steel of Structural Quality   |
| ASTM A 709/A 709M | (2000) Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched-and-Tempered Alloy Structural Steel Plate for Bridges |
| ASTM B 221        | (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes  |
| ASTM B 308        | (1995a) Aluminum-Alloy 6061-T6 Standard Structural Shapes  |
| ASTM D 395        | (1989; R 1994) Rubber Property - Compression Set   |
| ASTM D 412        | (1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension   |
| ASTM D 471        | (1995) Rubber Property - Effect of Liquids   |
| ASTM D 572        | (1988; R 1994) Rubber - Deterioration by Heat and Oxygen   |
| ASTM D 2240       | (1997e1) Rubber Property - Durometer   |

Hardness

AMERICAN WELDING SOCIETY (AWS)

AWS D1.5

(1996) Bridge Welding Code

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Detail Drawings; GA

Detail drawings shall be submitted as specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

SD-07 Schedules

Materials; FIO

Materials orders, materials lists and materials shipping bills shall be submitted as specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

SD-09 Reports

Tests, Inspections, and Verifications; FIO

Certified test reports for material tests shall be submitted with all materials delivered to the site.

SD-13 Certificates

Welding; FIO

Schedules of welding procedures for structural steel and welding processes for aluminum shall be submitted as specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

SD-18 Records

Materials Disposition Records; FIO

A system of identification which shows the disposition of specific lots of approved materials and fabricated items in the work shall be established and submitted before completion of the contract.

SD-19 Operation and Maintenance Manuals

Operation and Maintenance Manuals; FIO

Submit O&M Manuals for stoplogs before completion of the contract.

1.3 QUALIFICATION OF WELDERS AND WELDING OPERATORS

Qualification of welders and welding operators shall conform to the

requirements of Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

#### 1.4 DELIVERY, STORAGE AND HANDLING

Delivery, handling and storage of materials and fabricated items shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

##### 1.4.1 Rubber Seals

Rubber seals shall be stored in a place which permits free circulation of air, maintains a temperature of 70 degrees F or less, and prevents the rubber from being exposed to the direct rays of the sun. Rubber seals shall be kept free of oils, grease, and other materials which would deteriorate the rubber. Rubber seals shall not be distorted during handling.

### PART 2 PRODUCTS

#### 2.1 DISCHARGE CHAMBER STOPLOGS

##### 2.1.1 Stoplog Panels

Stoplog panels shall be provided for this phase of the project in the quantities as shown below. Each stoplog shall be single-panel construction. Each stoplog shall be sized for use over a circular pipe opening in a concrete wall. Each stoplog shall be fitted with J-type rubber seals permanently attached to the perimeter wet side of the panel to seat against the concrete wall. Each stoplog and components shall be designed as follows:

| Pump Station | Size | Quantity | Unseated Head |
|--------------|------|----------|---------------|
| C1           | 108" | 1        | 36 feet       |
| D3           | 108" | 2        | 36 feet       |
| E1           | 108" | 1        | 36 feet       |
| F1 (outlet)  | 48"  | 1        | 27 feet       |

Stoplog panels shall be fabricated from ASTM A 36 steel or aluminum. Each panel must weigh less than 3,000 pounds to allow installation using a readily available crane. A guide system shall be fabricated and installed in the discharge chamber to permit installation of stoplog panel by lowering the panel from top of discharge chamber. The guide system may be mounted to the chamber wall and shall guide and securely hold the stoplog panel to its "closure" position under the design unseated water head pressure. The guide system must also enable the storage of the panel along its length and allow operation from the top of the chamber.

##### 2.1.2 MATERIALS

Materials orders, materials lists and materials shipping bills shall conform to the requirements of Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

##### 2.1.2.1 Metals

Structural steel, structural aluminum, and other metal materials sections and standard articles shall be as shown and as specified herein and in



## Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

- a. Structural aluminum shall conform to ASTM B 221 and ASTM B 308, Alloy 6061, Temper T6.

## 2.1.1.2.2 Rubber Seals

Rubber seals shall be fluorocarbon (Teflon) clad rubber seals of the mold type only, shall be compounded of natural rubber, synthetic polyisoprene, or a blend of both, and shall contain reinforcing carbon black, zinc oxide, accelerators, antioxidants, vulcanizing agents, and plasticizers. Physical characteristics of the seals shall meet the following requirements:

| PHYSICAL TEST                            | TEST VALUE                         | TEST METHOD SPECIFICATION |
|--|------------------------------------|---------------------------|
| Tensile Strength                         | 2,500 psi (min.)                   | ASTM D 412                |
| Elongation at Break                      | 450% (min.)                        | ASTM D 412                |
| 300% Modulus                             | 900 psi (min.)                     | ASTM D 412                |
| Durometer Hardness<br>(Shore Type A)     | 60 to 70                           | ASTM D 2240               |
| *Water Absorption                        | 5% by weight (max.)                | ASTM D 471                |
| Compression Set                          | 30% (max.)                         | ASTM D 395                |
| Tensile Strength<br>(after aging 48 hrs) | 803500f tensile<br>strength (min.) | ASTM D 572                |

\* The "Water Absorption" test shall be performed with distilled water. The washed specimen shall be blotted dry with filter paper or other absorbent material and suspended by means of small glass rods in the oven at a temperature of 70 degrees plus/minus 2 degrees C for 22 plus/minus 1/4 hour. The specimen shall be removed, allowed to cool to room temperature in air, and weighed. The weight shall be recorded to the nearest 1 mg as W1 (W1 is defined in ASTM D 471). The immersion temperature shall be 70 degrees plus/minus 1 degree C and the duration of immersion shall be 166 hours.

- a. Fabrication: Rubber seals shall have a fluorocarbon film vulcanized and bonded to the sealing surface of the bulb. The film shall be 0.060 inch thick Huntington Abrasion Resistant Fluorocarbon Film No. 4508, or equal, and shall have the following physical properties:

Tensile strength ..... 2,000 psi (min.)

Elongation ..... 250 percent (min.)

The outside surface of the bonded film shall be flush with the surface of the rubber seal and shall be free of adhering or bonded rubber. Strips and corner seals shall be molded in lengths suitable for obtaining the finish lengths shown and with sufficient excess length to provide test specimens for testing the adequacy of the adhesion bond between the film and bulb of the seal. At one end of each strip or corner seal to be tested, the fluorocarbon film shall be masked during

bonding to prevent a bond for a length sufficient to hold the film securely during testing.

#### 2.1.3 Manufactured Units

Bolts, nuts, and washers shall conform to the requirements specified.

Manufactured units shall conform to the requirements specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

### 2.2 CLOSURE STRUCTURE STOPLOGS

#### 2.2.1 Stoplogs

Stoplogs shall be fabricated from aluminum tubes to the dimensions indicated on the drawings. Seal pads shall be bonded to the stoplogs as indicated on the drawings with an adhesive recommended by the manufacturer of the seal pad material and as approved and suited to the intended use. The pads shall also be attached with screws to the stoplogs as indicated on the drawings.

#### 2.2.2 Stoplog Grooves and Sill

Extra care shall be taken in the fabrication and installation of the stoplog grooves and sills to ensure that leakage is kept to a minimum. If leakage is kept to a minimum. If leakage is excessive and misalignment of the grooves and/or sills, or their component parts, is a contributing factor to the leakage, the Contractor shall propose corrective measures and shall implement corrective measures at no additional cost to the Government. Stoplog Groove and end sill surfaces in contact with concrete shall be coated with a bonding agent equal to Sika Armatec 110.

#### 2.2.3 Materials

Materials orders, materials lists and materials shipping bills shall conform to the requirements of Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

##### 2.2.3.1 Seal Pads

Seal pad material shall be fabricated from material having the same characteristics and material properties as one of the following products. The adhesive used to bond the material to the stoplog shall be recommended by the manufacturer and as submitted and approved. The following manufacturers are acceptable:

- a. Custom Urethane Elasomers, Inc.: Compound PO-655.
- b. Seals Unlimited, Inc.: Product 75A.
- c. Wendt Productions, Inc.: Keelshield (smooth surface).

##### 2.2.3.2 Structural Steel

All structural steel shall conform to ASTM A 572, Grade 50, or ASTM A 709/A 709M, unless specified otherwise. All structural steel shall be galvanized after fabrication except stainless steel. Material requirements for FCM shall be as specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

#### 2.2.3.3 Structural Aluminum

Structural aluminum shall conform to ASTM B 221 and ASTM B 308, Alloy 6061, Temper T6.

#### 2.2.3.4 Steel Threaded Rod

All steel threaded rod shall conform to ASTM A 449 and galvanized after fabrication.

#### 2.2.3.5 Stainless Steel Threaded Rod

All stainless steel threaded rod shall conform to ASTM A 276. The threaded rod shall be strain hardened Type 316 with a minimum yield strength equal to 75 ksi and a minimum ultimate strength equal to 95 ksi.

#### 2.2.3.6 Stop Tie-down Straps

Stop tie-down straps shall be 2-piece, 2 inch wide polyester webbed, with straps with flat hook on each end. A ratchet buckle shall be used for tightening. The minimum working load shall be 1000 pounds. The minimum length shall be 20 feet.

#### 2.2.3.7 Welded Shear Studs

Welded shear studs shall be Type A103. Studs shall have a minimum yield strength equal to 50 ksi and a minimum ultimate strength equal to 55 ksi.

#### 2.2.3.8 Bolts

All bolts shall conform to ASTM A 325.

#### 2.2.3.9 Nuts

All nuts shall conform to ASTM A 563.

#### 2.2.3.10 Welds

All welds shall have E70 electrodes. Refer to Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS for welding requirements including requirements for Fracture Critical Members (FCM).

### 2.3 FABRICATION

#### 2.3.1 Detail Drawings

Detail drawings of stoplogs and appurtenant shop fabricated items, including fabrication drawings, shop assembly drawings, delivery drawings, and field installation drawings, shall conform to the requirements specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

##### 2.3.1.1 Fabrication Drawings

Fabrication drawings shall show complete details of materials, tolerances, connections, and proposed welding sequences which clearly differentiate shop welds and field welds.

#### 2.3.1.2 Shop Assembly Drawings

Shop assembly drawings shall provide details for connecting the adjoining fabricated components in the shop to assure satisfactory field installation.

#### 2.3.1.3 Delivery Drawings

Delivery drawings shall provide descriptions of methods of delivering components to the site, including details for supporting fabricated components during shipping to prevent distortion or other damages.

#### 2.3.1.4 Field Installation Drawings

Field installation drawings shall provide a detailed description of the field installation procedures. The description shall include the location and method of support of installation and handling equipment; provisions to be taken to protect concrete and other work during installation; method of maintaining components in correct alignment; and methods for installing appurtenant items.

#### 2.3.2 Structural Fabrication

Structural fabrication shall conform to the requirements specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

#### 2.3.3 Welding

Welding shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS. Panels are considered Fracture Critical Members (FCM). Welds and materials are to meet requirements of AWS D1.5.

#### 2.3.4 Bolted Connections

Bolted connections shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

#### 2.3.5 Machine Work

Machine work shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

#### 2.3.6 Miscellaneous Provisions

Miscellaneous provisions for fabrication shall conform to the requirements specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

#### 2.3.7 Fabrications

##### 2.3.7.1 Stoplogs

Stoplogs shall be fabricated of aluminum 37,000 psi tensile yield strength minimum Alloy 6061, Temper T6.

##### 2.3.7.2 Stoplog Guides, Grooves, and Sills

Stoplog guides, grooves, and sills shall be fabricated of structural steel conforming to ASTM A 36, hot-dip galvanized as specified in Section 05055

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.7.3 Miscellaneous Embedded Metals

Corner protection angles, frames, base plates, and other embedded metal items required for complete installation shall conform to the details shown.

2.3.8 Seal Assemblies

Seal assemblies shall consist of rubber seals, spacer bars, and fasteners. Rubber seals shall be continuous over the full length. Seals shall be accurately fitted and drilled for proper installation. Bolt holes shall be drilled in the rubber seals by using prepared templates or the retainer bars as templates. Splices in seals shall be fully molded, develop a minimum tensile strength of 50 percent of the unspliced seal, and occur only at locations shown on fabrication drawings. All vulcanizing of splices shall be done in the shop. The vulcanized splices between molded corners and straight lengths shall be located as close to the corners as practicable. Splices shall be on a 45 degree bevel related to the "thickness" of the seal. The surfaces of finished splices shall be smooth and free of irregularities. Stainless steel retainer bars shall be field-spliced only where shown and machine-finished after splicing.

2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

Tests, inspections, and verifications for materials shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.4.1 Testing of Rubber Seals

The fluorocarbon film of rubber seals shall be tested for adhesion bond in accordance with ASTM D 413 using either the machine method or the deadweight method. A 1 inch long piece of seal shall be cut from the end of the seal which has been masked and subjected to tension at an angle approximately 90 degrees to the rubber surface. There shall be no separation between the fluorocarbon film and the rubber when subjected to a load of 30 pounds per inch width.

Failure of any specimen to meet the requirements of the test used will be cause for rejection of the piece from which the test specimen was taken.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall conform to the requirements specified and in SECTION 05055: METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

3.1.1 Embedded Metals

Corner protection angles, frames, base plates, and other embedded metal items required for complete installation shall be accurately installed to the alignment and grade required to ensure accurate fitting and matching of components. Anchors for embedded metals shall be installed as shown. Items requiring two concrete pours for installation shall be attached to the embedded anchors after the initial pour, adjusted to the proper alignment, and concreted in place with the second pour.

### 3.2 PROTECTION OF FINISHED WORK

Protection of finished work shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

### 3.3 ACCEPTANCE TRIAL OPERATION

After completion of installation, the Contracting Officer will examine the stoplog installation for final acceptance. The individual components of the stoplog installation will be examined first to determine whether or not the workmanship conforms to the specification requirements. The Contractor will be required to place the stoplogs in the guides a sufficient number of times to demonstrate that the stoplogs fit properly and seat uniformly. Required repairs or replacements to correct defects, shall be made at no cost to the Government. The trial operation shall be repeated after defects are corrected.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 06 - WOODS & PLASTICS

SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY AND STORAGE

PART 2 PRODUCTS

- 2.1 LUMBER AND SHEATHING
  - 2.1.1 Grading and Marking
    - 2.1.1.1 Lumber Products
    - 2.1.1.2 Fabricated Structural Members
    - 2.1.1.3 Plywood and Other Sheathing Products
  - 2.1.2 Sizes
  - 2.1.3 Treatment
    - 2.1.3.1 Lumber and Timbers
    - 2.1.3.2 Plywood
  - 2.1.4 Moisture Content
  - 2.1.5 Structural/Engineered Wood Members
    - 2.1.5.1 Design Criteria
    - 2.1.5.2 Allowable Design Values
    - 2.1.5.3 Trussed Rafters
  - 2.1.6 Sheathing
    - 2.1.6.1 Plywood
    - 2.1.6.2 Wood Structural Panels
    - 2.1.6.3 Wood
  - 2.1.7 Miscellaneous Wood Members
    - 2.1.7.1 Nonstress Graded Members
    - 2.1.7.2 Blocking
- 2.2 ACCESSORIES AND NAILS
  - 2.2.1 Anchor Bolts
  - 2.2.2 Bolts: Lag, Toggle, and Miscellaneous Bolts and Screws
  - 2.2.3 Clip Angles
  - 2.2.4 Expansion Shields
  - 2.2.5 Joist Hangers
  - 2.2.6 Metal Bridging
  - 2.2.7 Nails and Staples
- 2.3 INSULATION
  - 2.3.1 Batt or Blanket
    - 2.3.1.1 Glass Fiber Batts and Rolls
- 2.4 VAPOR RETARDER

PART 3 EXECUTION

- 3.1 INSTALLATION OF FRAMING
  - 3.1.1 General

## Grand Forks Phase 2 Levees

- 3.1.2 Structural Members
  - 3.1.2.1 Structural/Engineered Wood Members
- 3.1.3 Roof Framing or Rafters
- 3.2 INSTALLATION OF SHEATHING
  - 3.2.1 Plywood and Wood Structural Panels
  - 3.2.2 Wood
- 3.3 INSTALLATION OF MISCELLANEOUS WOOD MEMBERS
  - 3.3.1 Bridging
  - 3.3.2 Blocking
  - 3.3.3 Nailers and Nailing Strips
- 3.4 INSTALLATION OF INSULATION
- 3.5 INSTALLATION OF VAPOR RETARDER
- 3.6 TABLES

-- End of Section Table of Contents --



SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN FOREST & PAPER ASSOCIATION (AF&PA)

AF&PA T01 (1991; Supple 1993; Addenda Apr 1997;  
Supple T02) National Design Specification  
for Wood Construction

AF&PA T11 (1988) Manual for Wood Frame Construction

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

AITC TC Manual (1994) Timber Construction Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 307 (1997) Carbon Steel Bolts and Studs, 60  
000 PSI Tensile Strength

ASTM C 518 (1998) Steady-State Heat Flux Measurements  
and Thermal Transmission Properties by  
Means of the Heat Flow Meter Apparatus

ASTM C 665 (1998) Mineral-Fiber Blanket Thermal  
Insulation for Light Frame Construction  
and Manufactured Housing

ASTM E 96 (1995) Water Vapor Transmission of  
Materials

ASTM E 154 (1988; R 1999) Water Vapor Retarders Used  
in Contact with Earth Under Concrete  
Slabs, on Walls, or as Ground Cover

ASTM F 547 (1977; R 1995) Definitions of Terms  
Relating to Nails for Use with Wood and  
Wood-Base Materials

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C2 (1995) Lumber, Timber, Bridge Ties and  
Mine Ties - Preservative Treatment by  
Pressure Processes

Grand Forks Phase 2 Levees

AWPA C9 (1997) Plywood - Preservative Treatment by Pressure Processes

AWPA M4 (1996) Standard for the Care of Preservative-Treated Wood Products

AWPA P5 (1997) Standards for Waterborne Preservatives

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA PRP-108 (1980; Rev Jan 1996) Performance Standards and Policies for Structural-Use Panels

CALIFORNIA REDWOOD ASSOCIATION (CRA)

CRA RIS-01-SS (1997) Standard Specifications for Grades of California Redwood Lumber

DEPARTMENT OF COMMERCE (DOC)

DOC PS 1 (1996) Voluntary Product Standard - Construction and Industrial Plywood

DOC PS 2 (1992) Performance Standards for Wood-Based Structural-Use Panels

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM LPD 1-49 (1995) Loss Prevention Data Sheet - Perimeter Flashing

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules (1994) Rules for the Measurement & Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules (1997) Standard Grading Rules for Northeastern Lumber

SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

SCMA Specs (1986; Supple No. 1, Aug 1993) Standard Specifications for Grades of Southern Cypress

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB Rules (1994; Supple 8 thru 11) Standard Grading Rules for Southern Pine Lumber

TRUSS PLATE INSTITUTE (TPI)

TPI 1 (1995; Errata) National Design Standard for Metal Plate-Connected Wood Truss Construction and Commentary; and Appendix 1

## Grand Forks Phase 2 Levees

TPI Bklet HIB (1991) Handling, Installing & Bracing  
Metal Plate Connected Wood Trusses

### WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB Std 17 (1996; Supples VII(A-E), VIII(A-C))  
Grading Rules for West Coast Lumber

### WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA Grading Rules (1999) Western Lumber Grading Rules 95

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

#### Structural Wood Members; GA

Design analysis and calculations of fabricated wood trusses and other fabricated structural members showing design criteria used to accomplish the applicable analysis.

### SD-04 Drawings

#### Structural/Engineered Wood Members; GA

Drawings of fabricated wood trusses and other fabricated structural members indicating materials, shop fabrication, and field erection details; including methods of fastening.

## 1.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition, stored off ground in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

## PART 2 PRODUCTS

### 2.1 LUMBER AND SHEATHING

#### 2.1.1 Grading and Marking

##### 2.1.1.1 Lumber Products

Solid sawn and finger-jointed lumber shall bear an authorized gradestamp or grademark recognized by ALSC, or an ALSC recognized certification stamp, mark, or hammerbrand. Surfaces that are to be exposed to view shall not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

##### 2.1.1.2 Fabricated Structural Members

Wood trusses shall be fabricated in accordance with TPI 1.

##### 2.1.1.3 Plywood and Other Sheathing Products

Materials shall bear the grademark or other identifying marks indicating grades of material and rules or standards under which produced, including requirements for qualifications and authority of the inspection organization. Except for plywood and wood structural panels, bundle marking will be permitted in lieu of marking each individual piece. Surfaces that are to be exposed to view shall not bear grademarks or other types of identifying marks.

#### 2.1.2 Sizes

Lumber and material sizes shall conform to requirements of the rules or standards under which produced. Unless otherwise specified, lumber shall be surfaced on four sides. Unless otherwise specified, sizes indicated are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

#### 2.1.3 Treatment

Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPA M4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil. Except as specified for all-heart material of the previously mentioned species, the following items shall be treated:

- a. Wood members in contact with or within 18 inches of soil.
- b. Wood members in contact with water.
- c. Wood members exposed to the weather including those used in builtup roofing systems or as nailing strips or nailers over fiberboard or gypsum-board wall sheathing as a base for wood siding.
- d. Wood members set into concrete regardless of location, including flush-with-deck wood nailers for roofs.
- e. Wood members in contact with concrete that is in contact with soil or water or that is exposed to weather.

##### 2.1.3.1 Lumber and Timbers

Lumber and timbers shall be treated in accordance with AWPA C2 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

- a. 0.25 pcf intended for above ground use.
- b. 0.40 pcf intended for ground contact and fresh water use.

##### 2.1.3.2 Plywood

Plywood shall be treated in accordance with AWPA C9 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

- a. 0.25 pcf intended for above ground use.
- b. 0.40 pcf intended for ground contact and fresh water use.

#### 2.1.4 Moisture Content

At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:

a. Treated and Untreated Lumber Except Roof Planking: 4 inches or less, nominal thickness, 19 percent maximum. 5 inches or more, nominal thickness, 23 percent maximum in a 3 inch perimeter of the timber cross-section.

b. Roof Planking: 15 percent maximum.

c. Materials Other Than Lumber: In accordance with standard under which product is produced.

#### 2.1.5 Structural/Engineered Wood Members

##### 2.1.5.1 Design Criteria

Design trusses under direct supervision of a professional engineer experience in structural framing design of trusses. Structural design of trusses shall include wind load and gravity load causing critical design stresses. The design shall consider combined effects of bending and axial loads where appropriate. For combinations that include gravity and wind, allowable stresses may be increased by 1/3. The spacing for the trusses will be set at 24 inches, unless otherwise shown on the drawings.

The minimum design loads are as follows:

- a. The total superimposed downward load is 80 psf. The superimposed downward load on the truss top cord is 60 psf (includes 50 psf live load). The superimposed downward load on the truss bottom cord is 10 psf. The wind design shall be designed to accommodate a minimum wind speed of 80 mph, standard occupancy with an Exposure C classification.
- b. End gable truss shall be designed to transfer gable windloads to the longitudinal bracing roof system.

The manufacturer shall provide miscellaneous parts, including temporary bridging and permanent bracing and related items of hardware, metal hangers, anchors, and special metal shapes necessary for proper prefabrication, erection, assembly, supporting and anchoring of wood trusses.

##### 2.1.5.2 Allowable Design Values

Species and grades shall be as listed in AF&PA T01. Structural lumber used in fabrication of bolted trusses and other fabricated structural members for engineered uses, except laminated members, shall have allowable design values of 1050 psi in bending; 700 psi in tension parallel to the grain; 300 psi in compression perpendicular to the grain; 300 psi in compression parallel to the grain; 60 psi in horizontal shear; and a modulus of elasticity of 1,200,000 psi. Joists, rafters including trussed type, decking, and headers shall have design values of 1,200 psi in bending for repetitive member uses. Design of members and fastenings shall conform to AITC TC Manual. Other stress graded or dimensioned items such as blocking, carriages, and studs shall be standard or No. 2 grade except that studs may be Stud grade. The maximum moisture content of the wood shall be 19 percent.

#### 2.1.5.3 Trussed Rafters

As an option to standard rafters, trussed rafters may be provided. The design shall be as indicated. Connections shall be made with light-metal plate-connectors. Light-metal-plate-connected wood trusses shall be designed and fabricated in conformance with TPI 1. When new plate configuration is proposed, load testing of trusses is required and shall conform to Appendix D of TPI 1.

#### 2.1.6 Sheathing

Sheathing shall be plywood, wood structural panels, or wood for roof sheathing.

##### 2.1.6.1 Plywood

Plywood shall conform to DOC PS 1, APA PRP-108 or DOC PS 2, Grade C-D or sheathing grade with exterior glue. Sheathing for roof and walls without corner bracing of framing shall have a span rating of 16/0 or greater for supports 16 inches on center and a span rating of 24/0 or greater for supports 24 inches on center.

##### 2.1.6.2 Wood Structural Panels

Panels shall meet the qualification requirements of APA PRP-108 or DOC PS 2 for rated sheathing, Exposure 1 or Structural I rated sheathing, Exposure 1. Sheathing for roofs or walls without corner bracing of framing shall have a span rating of 16/0 or greater for supports 16 inches on center and shall have a span rating of 24/0 or greater for supports 24 inches on center.

##### 2.1.6.3 Wood

Species and grade shall be in accordance with TABLE I at the end of this section. Wall sheathing shall be 1 inch thick for supports 16 or 24 inches on center without corner bracing of framing provided sheathing is applied diagonally. Roof sheathing shall be 1 inch thick for supports 16 or 24 inches on center.

#### 2.1.7 Miscellaneous Wood Members

##### 2.1.7.1 Nonstress Graded Members

Members shall include bridging, corner bracing, furring, grounds, and nailing strips. Members shall be in accordance with TABLE I for the species used. Sizes shall be as follows unless otherwise shown:

| Member         | Size (inch)  |
|----------------|--|
| Bridging       | 1 x 3 or 1 x 4 for use between members 2 x 12 and smaller; 2 x 4 for use between members larger than 2 x 12. |
| Nailing strips | 1 x 3 or 1 x 4 when used as shingle base or interior finish, otherwise 2 inch stock.                         |

## Grand Forks Phase 2 Levees

### 2.1.7.2 Blocking

Blocking shall be standard or number 2 grade.

## 2.2 ACCESSORIES AND NAILS

Markings shall identify both the strength grade and the manufacturer. Accessories and nails shall conform to the following:

### 2.2.1 Anchor Bolts

ASTM A 307, size as indicated, complete with nuts and washers.

### 2.2.2 Bolts: Lag, Toggle, and Miscellaneous Bolts and Screws

Type, size, and finish best suited for intended use. Finish options include zinc compounds, cadmium, and aluminum paint impregnated finishes.

### 2.2.3 Clip Angles

Steel, 3/16 inch thick, size best suited for intended use; or zinc-coated steel or iron commercial clips designed for connecting wood members.

### 2.2.4 Expansion Shields

Type and size best suited for intended use.

### 2.2.5 Joist Hangers

Steel or iron, zinc-coated, size to fit members where used, sufficient strength to develop the full strength of supported member, complete with any special nails required.

### 2.2.6 Metal Bridging

Optional to wood bridging; zinc-coated steel, size and design to provide rigidity equivalent to specified wood bridging.

### 2.2.7 Nails and Staples

ASTM F 547, size and type best suited for purpose; staples shall be as recommended by the manufacturer of the materials to be joined. For sheathing, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails shall be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing shall be galvanized. Nailing shall be in accordance with the recommended nailing schedule contained in AF&PA T11. Where detailed nailing requirements are not specified, nail size and spacing shall be sufficient to develop an adequate strength for the connection. The connection's strength shall be verified against the nail capacity tables in AF&PA T01. Reasonable judgement backed by experience shall ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector shall be used.

## 2.3 INSULATION

Thermal resistance of insulation shall be not less than the R-values shown.

R-values shall be determined at 75 degrees F in accordance with ASTM C 518.

Insulation shall contain the highest practicable percentage of recovered material which has been recovered or diverted from solid waste, but not including material reused in a manufacturing process. Where two materials have the same price and performance, the one containing the higher recovered material content shall be provided. Insulation shall be the standard product of a manufacturer and factory marked or identified with manufacturer's name or trademark and R-value. Identification shall be on individual pieces or individual packages.

### 2.3.1 Batt or Blanket

#### 2.3.1.1 Glass Fiber Batts and Rolls

Glass fiber batts and rolls shall conform to ASTM C 665, Type I unfaced insulation. Width and length shall suit construction conditions.

### 2.4 VAPOR RETARDER

Vapor retarder shall be polyethylene sheeting conforming to ASTM E 154 or other equivalent material. Vapor retarder shall have a maximum vapor permeance rating of 0.5 perms as determined in accordance with ASTM E 96, unless otherwise specified.

## PART 3 EXECUTION

### 3.1 INSTALLATION OF FRAMING

#### 3.1.1 General

General framing shall be in accordance with AF&PA T11. Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place. Members shall be framed for passage of ducts. Members shall be cut, notched, or bored in accordance with applicable requirements of AF&PA T01 for the passage of pipes, wires, or conduits. Rafters, purlins, and joists shall be set with crown edge up. When joists, beams, and girders are placed on masonry or concrete, a wood base plate shall be positioned and leveled with grout. The joist, beam, or girder shall then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket shall be formed into the wall. The joist, beam, or girder shall then be placed into the pocket and leveled with a steel shim.

#### 3.1.2 Structural Members

Members shall be adequately braced before erection. Members shall be aligned and all connections completed before removal of bracing. Individually wrapped members shall be unwrapped only after adequate protection by a roof or other cover has been provided. Scratches and abrasions of factory-applied sealer shall be treated with two brush coats of the same sealer used at the factory.

##### 3.1.2.1 Structural/Engineered Wood Members

Set and secure wood trusses level, plumb, and place in correct locations. Temporary bracing and anchorage shall be provided to hold trusses in place until permanently secured. Ensure trusses have sufficient bearing area and install permanent bracing and bridging prior to application of design loads. Members may not be cut or altered. Regarding wood preservatives,



brush apply 2 coats on members in contact with sheet metal, members in contact with cementitious materials, and ensure saw cut ends are protected. Steel connects shall be compatible with the selected wood treatment. Connector plates shall be G90 galvanized sheet steel, die stamped with integral teeth, minimum 20-gauge thickness.

### 3.1.3 Roof Framing or Rafters

Tops of supports or rafters shall form a true plane. Valley, ridge, and hip members shall be of depth equal to cut on rafters where practicable, but in no case less than depth of rafters. Valleys, hips, and ridges shall be straight and true intersections of roof planes. Necessary crickets and watersheds shall be formed. Rafters, except hip and valley rafters, shall be spiked to wall plate and to ceiling joists with no less than three 8-penny nails. Rafters shall be toe-nailed to ridge, valley, or hip members with at least three 8-penny nails. Rafters shall be braced to prevent movement until permanent bracing, decking or sheathing is installed. Hip and valley rafters shall be secured to wall plates by clip angles. Openings in roof shall be framed with headers and trimmers. Unless otherwise indicated, headers carrying more than two rafters and trimmers supporting headers carrying more than one rafter shall be double. Hip rafters longer than the available lumber shall be butt jointed and scabbed. Valley rafters longer than the available lumber shall be double, with pieces lapped not less than 4 feet and well spiked together. Trussed rafters shall be installed in accordance with TPI Bklet HIB. Engineered wood joists shall be installed in accordance with distributor's instructions.

## 3.2 INSTALLATION OF SHEATHING

### 3.2.1 Plywood and Wood Structural Panels

Sheathing shall be applied with edges 1/8 inch apart at side and end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center unless otherwise shown. Nailing of edges shall be 3/8 inch from the edges. Roof sheathing shall be applied with long dimension at right angles to supports, end joints made over supports, and end joints staggered.

### 3.2.2 Wood

Sheathing end joints shall be made over framing members and so alternated that there will be at least two boards between joints on the same support. Each board shall bear on at least three supports. Boards shall be nailed at each support using two nails for boards 6 inches and less in width and three nails for boards more than 6 inches in width. Roof sheathing shall not be installed where roof decking is installed.

## 3.3 INSTALLATION OF MISCELLANEOUS WOOD MEMBERS

### 3.3.1 Bridging

Wood bridging shall have ends accurately bevel-cut to afford firm contact and shall be nailed at each end with two nails. Metal bridging shall be installed as recommended by the manufacturer. The lower ends of bridging shall be driven up tight and secured after subflooring or roof sheathing has been laid and partition framing installed.

### 3.3.2 Blocking

Blocking shall be provided as necessary for application of siding, sheathing, and other materials or building items, and to provide firestopping. Blocking for firestopping shall ensure a maximum dimension of 8 feet for any concealed space. Blocking shall be cut to fit between framing members and rigidly nailed thereto.

### 3.3.3 Nailers and Nailing Strips

Nailers and nailing strips shall be provided as necessary for the attachment of finish materials. Nailers used in conjunction with roof deck installation shall be installed flush with the roof deck system. Stacked nailers shall be assembled with spikes or nails spaced not more than 18 inches on center and staggered. Beginning and ending nails shall not be more than 6 inches for nailer end. Ends of stacked nailers shall be offset approximately 12 inches in long runs and alternated at corners. Anchors shall extend through the entire thickness of the nailer. Strips shall be run in lengths as long as practicable, butt jointed, cut into wood framing members when necessary, and rigidly secured in place. Nailers and nailer installation for Factory Mutual wind uplift rated roof systems specified in other Sections of these specifications shall conform to the recommendations contained in FM LPD 1-49.

### 3.4 INSTALLATION OF INSULATION

Insulation shall be installed after construction has advanced to a point that the installed insulation will not be damaged by remaining work. For thermal insulation the actual installed thickness shall provide the R-values shown. Insulation shall be installed on the weather side of such items as electrical boxes and water lines. Unless otherwise specified, installation shall be in accordance with the manufacturer's recommendation.

### 3.5 INSTALLATION OF VAPOR RETARDER

Joints in the vapor retarder shall be lapped and sealed according to the manufacturer's recommendations.

## 3.6 TABLES

TABLE I. SPECIES AND GRADE

Subflooring, Roof Sheathing, Wall Sheathing, Furring

| Grading Rules       | Species                  | Const Standard | No. 2 Comm | No. 2 Board Comm | No. 3 Comm |
|---------------------|--------------------------|----------------|------------|------------------|------------|
| NHLA Rules          | Cypress                  |                |            | X                |            |
| NELMA Grading Rules | Northern White Cedar     |                |            |                  | X          |
|                     | Eastern White Pine       | X              |            |                  |            |
|                     | Northern Pine            | X              |            |                  |            |
|                     | Balsam Fir               |                |            |                  | X          |
|                     | Eastern Hemlock-Tamarack |                |            |                  | X          |
| CRA RIS-01-SS       | Redwood                  |                | X          |                  |            |
| SCMA Specs          | Cypress                  |                |            | X                |            |
| SPIB Rules          | Southern Pine            |                | X          |                  |            |
| WCLIB Std 17        | Douglas Fir-Larch        | X              |            |                  |            |
|                     | Hem-Fir                  | X              |            |                  |            |
|                     | Sitka Spruce             | X              |            |                  |            |
|                     | Mountain Hemlock         | X              |            |                  |            |
|                     | Western Cedar            | X              |            |                  |            |
| WWPA Grading Rules  | Douglas Fir-Larch        | X              |            |                  |            |
|                     | Hem-Fir                  | X              |            |                  |            |
|                     | Idaho White Pine         | X              |            |                  |            |
|                     | Lodgepole Pine           |                |            | X                |            |
|                     | Ponderosa Pine           |                |            | X                |            |
|                     | Sugar Pine               |                |            | X                |            |
|                     | Englemann Spruce         |                |            | X                |            |
|                     | Douglas Fir South        |                |            | X                |            |
|                     | Mountain Hemlock         |                |            | X                |            |
|                     | Subalpine Fir            |                |            | X                |            |
|                     | Western Cedar            |                |            | X                |            |

TABLE II. SPECIES AND GRADE

Wood Bumpers

| Grading Rules | Species | No. 1 | No. 2 |
|---------------|---------|-------|-------|
| NHLA Rules    |         |       |       |

TABLE II. SPECIES AND GRADE

| Wood Bumpers        |                          |       |       |
|---------------------|--------------------------|-------|-------|
| Grading Rules       | Species                  | No. 1 | No. 2 |
|                     | Red Oak                  | X     |       |
| NELMA Grading Rules | Northern Pine            |       | X     |
|                     | Eastern Hemlock-Tamarack |       | X     |
| SPIB Rules          | Southern Pine            | X     |       |
| WCLIB Std 17        | Douglas Fir-Larch        |       | X     |
|                     | Hem-Fir                  |       | X     |
| WWPA Grading Rules  | Douglas Fir-Larch        |       | X     |
|                     | Hem-Fir                  |       | X     |
|                     | Douglas Fir-South        |       | X     |

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 06 - WOODS & PLASTICS

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 QUALITY ASSURANCE
- 1.3 DELIVERY, STORAGE AND HANDLING

PART 2 PRODUCTS

- 2.1 LUMBER
  - 2.1.1 Lumber For Transparent Finish (Stained or Clear)
  - 2.1.2 Lumber For Painted Finish
- 2.2 EXTERIOR TRIM
  - 2.2.1 Trim
- 2.3 EXTERIOR PLYWOOD SOFFIT
- 2.4 INTERIOR CEILING AND WALL SIDING
- 2.5 SIMULATED WOOD MILLWORK
- 2.6 SOLID SURFACING COUNTERTOPS AND SINKS
- 2.7 MISCELLANEOUS HARDWARE

PART 3 EXECUTION

- 3.1 INSTALLATION - GENERAL
- 3.2 INSTALLATION - WOOD TRIM
- 3.3 INSTALLATION - SIMULATED WOOD MILLWORK
- 3.4 INSTALLATION
- 3.5 FINISH
- 3.6 CLEANUP AND ADJUSTMENT

-- End of Section Table of Contents --

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 20 (1994; Addenda Jan. 1997) American  
Softwood Lumber Standard

1.2 QUALITY ASSURANCE

Factory-mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.

1.3 DELIVERY, STORAGE AND HANDLING

Do not deliver lumber or trim until suitable storage is available on site; take care to avoid moisture buildup. Store in accordance with good practice to avoid warp, damage, soiling and deterioration.

PART 2 PRODUCTS

2.1 LUMBER

Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to actual sizes as required by NIST PS 20 or to actual sizes and patterns as shown, unless otherwise indicated. Provide seasoned (KD) lumber having a moisture content from time of manufacture until time of installation not greater than values required by applicable grading rules of respective grading and inspecting agency for species and product indicated. Provide kiln-dried (KD) hardwood lumber having a moisture content from time of manufacture until time of installation within ranges required in referenced woodworking standard.

2.1.1 Lumber For Transparent Finish (Stained or Clear)

Use pieces made of solid lumber stock.

2.1.2 Lumber For Painted Finish

At Contractor's option, use pieces which are either glued-up lumber or made

of solid lumber stock.

## 2.2 EXTERIOR TRIM

### 2.2.1 Trim

Western red cedar, B Clear, rough sawn.

## 2.3 EXTERIOR PLYWOOD SOFFIT

1/2 inch Wester Red cedar plywood, "B" Grade.

## 2.4 INTERIOR CEILING AND WALL SIDING

5/8 inch T & G Pine.

## 2.5 SIMULATED WOOD MILLWORK

High-density polymer comparable to kiln dried white pine with high skin density with factory coated exterior acrylic emulsion paint manufactured by Fypon Molded Millwork, Fypon, Ltd.; or equal.

## 2.6 SOLID SURFACING COUNTERTOPS AND SINKS

Built-in sinks and countertops with solid surfacing, top, edge, and backsplash manufactured by DuPont Corian, or equal. Color shall be selected from manufacturer's standard color line.

## 2.7 MISCELLANEOUS HARDWARE

Furnish miscellaneous hardware including but not limited to nails, screws, bolts, toggle bolts, staples, masonry anchors, and appurtenances.

# PART 3 EXECUTION

## 3.1 INSTALLATION - GENERAL

Condition woodwork to average prevailing humidity prior to installation. Install carpentry and woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Where woodwork abuts other finished work, scribe and cut for accurate fit. Before making cutouts, drill pilot holes at corners. Distribute defects (as permitted by specified quality grade) to best over-all advantage.

## 3.2 INSTALLATION - WOOD TRIM

Install trim in single, unjointed lengths for openings and runs less than 10 feet. For longer runs, use only one piece less than 10 feet in any straight run. Stagger joints in adjacent members. Cope at returns and miter corners. Attach trim securely with uniform joints providing for building movements. Secure woodwork to anchors or blocking built-in or directly attached to substrates. Blind nail where possible. Use fine finishing nails where exposed. Set exposed nail heads for filling, except for exterior wood which receives natural finish (if any). Clean woodwork and fill nail holes in preparation for finishes specified under Section 09900 PAINTING, GENERAL. Where woodwork is to receive transparent finish, use matching wood filler.

## 3.3 INSTALLATION - SIMULATED WOOD MILLWORK

Install according to manufacturer's recommendations. Site verify field conditions and adjust millwork size accordingly.

#### 3.4 INSTALLATION

Solid surfacing countertops and sinks shall be installed according to manufacturer's recommendations.

#### 3.5 FINISH

See Section 09900 PAINTING, GENERAL.

#### 3.6 CLEANUP AND ADJUSTMENT

Repair defective work. Adjust and lubricate hardware for proper operation. Clean exposed interior and exterior surfaces. Clean woodwork and touch-up finish as required. Replace damaged areas.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 07 - THERMAL & MOISTURE PROTECTION

SECTION 07311

ROOFING, STRIP SHINGLES

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY AND STORAGE OF MATERIALS
- 1.4 WARRANTY

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Metal Drip Edges
  - 2.1.2 Underlayment
  - 2.1.3 Waterproof Underlayment
  - 2.1.4 Nails
  - 2.1.5 Asphalt Roof Shingles
  - 2.1.6 Metal Shake Shingles
- 2.2 COLOR

PART 3 EXECUTION

- 3.1 PREPARATION OF SURFACES
- 3.2 APPLICATION OF ROOFING MATERIALS
  - 3.2.1 Flashings
  - 3.2.2 Metal Drip Edges
  - 3.2.3 Underlayment
  - 3.2.4 Shingles

-- End of Section Table of Contents --

SECTION 07311

ROOFING, STRIP SHINGLES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |  |
|-------------|--|
| ASTM D 226  | (1997a) Asphalt-Saturated Organic Felt<br>Used in Roofing and Waterproofing  |
| ASTM D 1970 | (1997) Self-Adhering Polymer Modified<br>Bituminous Sheet Materials Used as Steep<br>Roofing Underlayment for Ice Dam Protection |
| ASTM D 3018 | (1990; R 1994) Class A Asphalt Shingles<br>Surfaced With Mineral Granules  |
| ASTM D 3161 | (1995a) Wind-Resistance of Asphalt<br>Shingles (Fan-Induced Method)  |
| ASTM D 3462 | (1997) Asphalt Shingles Made From Glass<br>Felt and Surfaced with Mineral Granules   |
| ASTM D 4869 | (1988; R 1993) Asphalt-Saturated Organic<br>Felt Shingle Underlayment Used in Roofing  |
| ASTM E 108  | (1996) Fire Tests of Roof Coverings  |

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

|                          |                                       |
|--------------------------|---------------------------------------|
| NRCA Asph Shing Roof Mnl | (1996) Asphalt Shingle Roofing Manual |
|--------------------------|---------------------------------------|

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-14 Samples

Shingles; GA

Full shingle sample and manufacturer's standard size samples of materials and products requiring color or finish selection.

1.3 DELIVERY AND STORAGE OF MATERIALS

Materials shall be delivered in manufacturer's unopened bundles and containers with the manufacturer's brand and name marked clearly thereon. Shingles shall be stored in accordance with manufacturer's printed instructions. Roll goods shall be stored on end in an upright position or in accordance with manufacturer's recommendations. Immediately before laying, roofing felt shall be stored for 24 hours in an area maintained at a temperature not lower than 50 degrees F.

#### 1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

Materials shall conform to the following requirements:

##### 2.1.1 Metal Drip Edges

Metal drip edges shall conform to Section 07600 SHEET METALWORK, GENERAL. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

##### 2.1.2 Underlayment

Organic felt; ASTM D 4869 or ASTM D 226, non perforated Type II, heavy-duty number 30.

##### 2.1.3 Waterproof Underlayment

Self-adhering leak barrier or ice dam underlayment shall comply with ASTM D 1970 for sealability around nails.

##### 2.1.4 Nails

Nails shall be round head 11 or 12 gauge galvanized steel or equivalent corrosion resistant roofing nails. Nail heads shall be 3/8 inch minimum diameter, with flat and smooth low profile. Shanks shall be barbed or otherwise deformed for added pull-out resistance. Nails shall be long enough to penetrate all layers of roofing materials and achieve secure anchorage into the roof deck. Nails shall extend through the underside of plywood or wood panel roof decks, and shall penetrate at least 3/4 inch into wood plank decks.

##### 2.1.5 Asphalt Roof Shingles

Shingles shall be approximately 12 by 36 inches in dimension and three-tab strip design. Shingles shall have self-sealing adhesive strips and shall meet a wind velocity rating of 80 mph plus or minus 5 percent in accordance with ASTM D 3161. Shingles shall be manufacturer's standard type for project area. Glass felt shingles shall comply with ASTM D 3018 and ASTM D 3462 Type I (self-sealing), ASTM E 108 Class A (a light degree of fire protection), and shall weigh not less than 340 lbs.

##### 2.1.6 Metal Shake Shingles

Shake shingles shall have approximately a 1 inch butt with a shake texture and 5 shingle modules, with a 12 by 24 inch exposure. Shingles shall be 24

gauge prefinished galvalume. Finish shall be Kynar 500 fluorocarbon coating applied with at top side film thickness of 0.80 to 0.90 mil over 0.20 to 0.25 mil prime coat for a total dry film thickness of 1.0 to 1.15 mil. The reverse side shall be coated with a backer coating of 0.25 mil nominal dry film thickness. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by Kynar 500 finish supplier. A strippable coating shall be applied to the top side during fabrication, shipping, and field handling. Strippable coating shall be removed before installation. Do not expose material to weather and moisture. All exposed adjacent flashings shall be of the same materials and finish as panel system.

## 2.2 COLOR

Shingle color shall be in accordance with Section 09915 COLOR SCHEDULE.

## PART 3 EXECUTION

### 3.1 PREPARATION OF SURFACES

The construction of any bay or section of roof decking shall be completed before roofing work is started. Roof surfaces shall be smooth, firm, dry, and free from loose boards, large cracks, and projecting ends that might damage the roofing. Vents and other projections through roofs shall be properly flashed and secured in position, and projecting nails shall be driven flush with the deck.

### 3.2 APPLICATION OF ROOFING MATERIALS

#### 3.2.1 Flashings

Metal flashings shall conform to Section 07600 SHEET METALWORK, GENERAL. Metal flashings shall be provided at the intersections of roofs and adjoining walls and at projections through the deck such as vent stacks. Valley flashing shall be of the woven type for asphalt roofing shingles, in accordance with NRCA Asph Shing Roof Mnl.

#### 3.2.2 Metal Drip Edges

Metal drip edges shall be provided along the eaves and rakes. The metal drip edge shall be applied directly over the underlayment along the rakes and directly on the wood deck at the eaves. Metal drip edges shall extend back from the edge of the deck not less than 4 inches and shall be secured with compatible nails spaced not more than 10 inches on center along the inner edge.

#### 3.2.3 Underlayment

Before any shingles are applied, 1 or 2 layers of asphalt-saturated-felt underlayment shall be applied to the roof deck sheathing as shown on drawings. A self adhesive leak barrier underlayment shall be applied starting from the eaves to a point 24 inches inside the interior wall line and around roof opening penetrations at the curb.

#### 3.2.4 Shingles

Shingles with the correct recommended exposure shall be applied in accordance with the manufacturer's printed instructions as they appear on the bundle wrapping.

Grand Forks Phase 2 Levees

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 07 - THERMAL & MOISTURE PROTECTION

SECTION 07412

NON-STRUCTURAL METAL ROOFING

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 GENERAL REQUIREMENTS
  - 1.3.1 Non-Structural Metal Roof System
  - 1.3.2 Manufacturer
  - 1.3.3 Installer
- 1.4 DESIGN LOADS
- 1.5 PERFORMANCE REQUIREMENTS
- 1.6 DELIVERY AND STORAGE
- 1.7 WARRANTIES
  - 1.7.1 Contractor's Weathertightness Warranty
  - 1.7.2 Manufacturer's Material Warranties
- 1.8 COORDINATION MEETING

PART 2 PRODUCTS

- 2.1 ROOF PANELS
  - 2.1.1 Steel Panels
- 2.2 ACCESSORIES
- 2.3 FASTENERS
- 2.4 FACTORY COLOR FINISH
  - 2.4.1 Cyclic Salt Fog/UV Test
  - 2.4.2 Formability Test
- 2.5 UNDERLAYMENTS
  - 2.5.1 Felt Underlayment
  - 2.5.2 Adhered Waterproof Underlayment
  - 2.5.3 Slip Sheet
- 2.6 SEALANT
- 2.7 GASKETS AND INSULATING COMPOUNDS

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Roofing
  - 3.1.2 Field Forming of Roof Panels for Unique Areas
  - 3.1.3 Underlayment

-- End of Section Table of Contents --

SECTION 07412

NON-STRUCTURAL METAL ROOFING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |  |
|-------------------|--|
| ASTM A 463/A 463M | (1999a) Steel Sheet, Aluminum-Coated, by the Hot-Dip Process   |
| ASTM A 653/A 653M | (1999a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process  |
| ASTM A 792/A 792M | (1999) Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process  |
| ASTM D 226        | (1997a) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing   |
| ASTM D 522        | (1993a) Mandrel Bend Test of Attached Organic Coatings   |
| ASTM D 610        | (1995) Evaluating Degree of Rusting on Painted Steel Surfaces  |
| ASTM D 714        | (1987; R 1994e1) Evaluating Degree of Blistering of Paints   |
| ASTM D 1654       | (1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments   |
| ASTM D 2244       | (1995) Calculation of Color Differences from Instrumentally Measured Color Coordinates   |
| ASTM D 4214       | (1998) Evaluating Degree of Chalking of Exterior Paint Films   |
| ASTM D 5894       | (1996) Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet |

UNDERWRITERS LABORATORIES (UL)

UL 580

(1994; Rev thru Feb 1998) Tests for Uplift  
Resistance of Roof Assemblies

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-04 Drawings

Metal Roofing; GA

a. Drawings consisting of catalog cuts, flashing details, erection drawings, shop coating and finishing specifications, and other data as necessary to clearly describe materials, sizes, layouts, construction details, fasteners, and erection. Drawings shall be provided by the metal roofing manufacturer.

b. Drawings showing the UL 580, Class 90 tested roof system assembly.

### SD-13 Certificates

Roof Panels; GA  
Installation; GA  
Accessories; GA

Certificates attesting that the panels and accessories conform to the specified requirements. Certificate for the roof assembly shall certify that the assembly complies with the material and fabrication requirements specified and is suitable for the installation at the indicated design slope. Certified laboratory test reports showing that the sheets to be furnished are produced under a continuing quality control program and that at least 3 representative samples of similar material to that which will be provided on this project have been previously tested and have met the quality standards specified for factory color finish.

Installer; GA

Certification of installer.

Warranties; GA

At the completion of the project, signed copies of the 5-year Warranty for Non-Structural Metal Roofing System, a sample copy of which is attached to this section, and the 20-year Manufacturer's Material Warranties.

### SD-14 Samples

Accessories; GA

One sample of each type of flashing, trim, fascia, closure, cap and similar items. Size shall be sufficient to show construction and configuration.

Roof Panels; GA



One piece of each type and finish to be used, 9 inches long, full width.

Fasteners; GA

Two samples of each type to be used with statement regarding intended use. If so requested, random samples of screws, bolts, nuts, and washers as delivered to the jobsite shall be taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

Gaskets and Insulating Compounds; GA

Two samples of each type to be used and descriptive data.

Sealant; GA

One sample, approximately 1 pound, and descriptive data.

### 1.3 GENERAL REQUIREMENTS

The Contractor shall furnish a commercially available roofing system which satisfies the specified design and additional requirements contained herein. The roofing system shall be provided by the Contractor as a complete system, as tested and approved in accordance with UL 580. Roof panels, components, transitions, accessories, and assemblies shall be supplied by the same roofing system manufacturer.

#### 1.3.1 Non-Structural Metal Roof System

The Non-Structural Metal Roof System covered under this specification shall include the entire roofing system; the metal roof panels, fasteners, connectors, roof securement components, and assemblies tested and approved in accordance with UL 580. The system shall be installed on a substrate specified in Section 06100 ROUGH CARPENTRY. In addition, the system shall consist of panel finishes, slip sheet, insulation, vapor retarder, all accessories, components, and trim and all connections with roof panels. This includes roof penetration items such as vents, curbs, skylights; interior or exterior gutters and downspouts, eaves, ridge, hip, valley, rake, gable, wall, snow guards, or other roof system flashings installed and any other components specified within this contract to provide a weathertight roof system; and items specified in other sections of the specifications that are part of the system.

#### 1.3.2 Manufacturer

The non-structural metal roofing system shall be the product of a manufacturer who has been in the practice of manufacturing metal roofs for a period of not less than 3 years and has been involved in at least five projects similar in size and complexity to this project.

#### 1.3.3 Installer

The installer shall be certified by the metal roof manufacturer to have experience in installing at least three projects that are of comparable size, scope and complexity as this project for the particular roof system furnished. The installer may be either employed by the manufacturer or be

an independent installer.

#### 1.4 DESIGN LOADS

Non-structural Metal Roof System assemblies shall be tested as defined in UL 580 and shall be capable of resisting the wind uplift pressures shown on the contract drawings or, as a minimum, shall be approved to resist wind uplift pressures of UL 580, Class 90.

#### 1.5 PERFORMANCE REQUIREMENTS

The metal roofing system supplied shall conform to the roof slope, the underlayment, and uplift pressures shown on the contract drawings. The Contractor shall furnish a commercially available roofing system which satisfies all the specified requirements.

#### 1.6 DELIVERY AND STORAGE

Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials shall be covered with weather tight coverings and kept dry. Material shall not be covered with plastic where such covering will allow sweating and condensation. Plastic may be used as tenting with air circulation allowed. Storage conditions shall provide good air circulation and protection from surface staining.

#### 1.7 WARRANTIES

The Non-Structural Metal Roofing System shall be warranted as outlined below. Any emergency temporary repairs conducted by the owner shall not negate the warranties.

##### 1.7.1 Contractor's Weathertightness Warranty

The Non-Structural Metal Roofing System shall be warranted by the Contractor on a no penal sum basis for a period of five years against material and workmanship deficiencies; system deterioration caused by exposure to the elements and/or inadequate resistance to specified service design loads, water leaks, and wind uplift damage. The roofing covered under this warranty shall include the entire roofing system, including but not limited to, the roof panels, fasteners, connectors, roof securement components, and assemblies tested and approved in accordance with UL 580. In addition, the system shall consist of panel finishes, slip sheet, insulation, vapor retarder, all accessories, components, and trim and all connections with roof panels. This includes roof penetration items such as vents, curbs, skylights; interior or exterior gutters and downspouts; eaves, ridge, hip, valley, rake, gable, wall, or other roof system flashings installed and any other components specified within this contract to provide a weathertight roof system; and items specified in other sections of the specifications that are part of the roof system. All material and workmanship deficiencies, system deterioration caused by exposure to the elements and/or inadequate resistance to service design loads, water leaks and wind uplift damage shall be repaired as approved by the Contracting Officer. See the attached Contractor's required warranty for issue resolution of warrantable defects. This warranty shall warrant and cover the entire cost of repair or replacement, including all material, labor, and related markups. The Contractor shall supplement this warranty with written warranties from the installer and system manufacturer, which shall be submitted along with Contractor's warranty; however, the Contractor shall be ultimately responsible for this warranty. The

Contractor's written warranty shall be as outlined in attached WARRANTY FOR NON-STRUCTURAL METAL ROOF SYSTEM, and shall start upon final acceptance of the facility. It is required that the Contractor provide a separate bond in an amount equal to the installed total roofing system cost in favor of the owner (Government) covering the Contractor's warranty responsibilities effective throughout the 5 year Contractor's warranty period for the entire roofing system as outlined above.

#### 1.7.2 Manufacturer's Material Warranties

The Contractor shall furnish, in writing, the following manufacturer's material warranties which cover all Non-Structural Metal Roofing System components such as roof panels, flashing, accessories, and trim, fabricated from coil material:

a. A manufacturer's 20 year material warranty warranting that the aluminum, zinc-coated steel, aluminum-zinc alloy coated steel or aluminum-coated steel as specified herein will not rupture, fail structurally, or perforate under normal atmospheric conditions at the site. Liability under this warranty shall be limited exclusively to the cost of either repairing or replacing nonconforming, ruptured, perforated, or structurally failed coil material.

b. A manufacturer's 20 year exterior material finish warranty warranting that the factory color finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a numerical rating of 8 when measured in accordance with ASTM D 4214; or fade or change colors in excess of 5 NBS units as measured in accordance with ASTM D 2244. Liability under this warranty is exclusively limited to refinishing or replacing the defective coated coil material.

#### 1.8 COORDINATION MEETING

A coordination meeting shall be held within 45 days after contract award for mutual understanding of the metal roofing system contract requirements.

This meeting shall take place at the building site and shall include representatives from the Contractor, the roofing system manufacturer, the roofing supplier, the erector, the designer, and the Contracting Officer. All items required by paragraph SUBMITTALS shall be discussed, including applicable standard manufacturer shop drawings, and the approval process. The Contractor shall coordinate time and arrangements for the meeting.

### PART 2 PRODUCTS

#### 2.1 ROOF PANELS

Panels shall be steel and shall have a factory color finish. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope for slope lengths that do not exceed 30 feet. Sheets longer than 30 feet may be furnished if approved by the Contracting Officer. Width of sheets shall provide nominal 12 inches of coverage in place. Design provisions shall be made for thermal expansion and contraction consistent with the type of system to be used. All sheets shall be either square-cut or miter-cut. The ridge cap shall be installed as recommended by the metal roofing manufacturer. Height of corrugations, ribs, or seams, at overlap of adjacent roof sheets shall be the building manufacturer's standard for the indicated roof slope.

##### 2.1.1 Steel Panels

Zinc-coated steel conforming to ASTM A 653/A 653M; aluminum-zinc alloy coated steel conforming to ASTM A 792/A 792M, AZ 50 coating; or aluminum-coated steel conforming to ASTM A 463/A 463M, Type 2, coating designation T2 65. Uncoated roof panels shall be 0.024 inch thick minimum. Panels shall be within 95 percent of the nominal thickness.

## 2.2 ACCESSORIES

Accessories shall be compatible with the roofing furnished. Flashing, trim, metal closure strips, caps, and similar metal accessories shall be not less than the minimum thicknesses specified for roof panels. Exposed metal accessories shall be finished to match the panels furnished. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the panels and shall not absorb or retain water.

## 2.3 FASTENERS

Fasteners for roof panels shall be zinc-coated steel, aluminum, or nylon capped steel, type and size as recommended by the manufacturer to meet the performance requirements. Fasteners for accessories shall be the manufacturer's standard. Exposed roof fasteners shall be gasketed or have gasketed washers on the exterior side of the roofing to waterproof the fastener penetration. Washer material shall be compatible with the panels; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 1/8 inch thick.

## 2.4 FACTORY COLOR FINISH

Panels shall have a factory applied polyvinylidene fluoride finish on the exposed side. The exterior finish shall consist of a baked-on topcoat with an appropriate prime coat. Color shall match the color indicated in Section 09915 COLOR SCHEDULE. The exterior coating shall be a nominal 1 mil thickness consisting of a topcoat of not less than 0.7 mil dry film thickness and the paint manufacturer's recommended primer of not less than 0.2 mil thickness. The exterior color finish shall meet the test requirements specified below.

### 2.4.1 Cyclic Salt Fog/UV Test

A sample of the sheets shall withstand a cyclic corrosion test for a minimum of 2016 hours in accordance with ASTM D 5894, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall receive a rating of not less than 10, no blistering, as determined by ASTM D 714; 10, no rusting, as determined by ASTM D 610; and a rating of 6, over 1/16 to 1/8 inch failure at scribe, as determined by ASTM D 1654.

### 2.4.2 Formability Test

When subjected to testing in accordance with ASTM D 522 Method B, 1/8 inch diameter mandrel, the coating film shall show no evidence of fracturing to the naked eye.

## 2.5 UNDERLAYMENTS

### 2.5.1 Felt Underlayment

Felt underlayment shall be No. 30 felt in accordance with ASTM D 226, Type II.

#### 2.5.2 Adhered Waterproof Underlayment

Underlayment shall be equal to "Ice and Water Shield" as manufactured by Grace Construction Products, "Winterguard" as manufactured by CertainTeed Corporation, or "Weather Watch Ice and Water Barrier" as manufactured by GAF Building Materials Corporation.

#### 2.5.3 Slip Sheet

Slip Sheet shall be 5 pounds per 100 sf rosin sized unsaturated building paper.

#### 2.6 SEALANT

Sealant shall be an elastomeric type containing no oil or asphalt. Exposed sealant shall be colored to match the applicable building color and shall cure to a rubberlike consistency. Sealant placed in the roof panel standing seam ribs shall be provided in accordance with the manufacturer's recommendations.

#### 2.7 GASKETS AND INSULATING COMPOUNDS

Gaskets and insulating compounds shall be nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Installation shall be in accordance with the manufacturer's erection instructions and drawings. Dissimilar materials which are not compatible when contacting each other shall be insulated by means of gaskets or insulating compounds. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, sheets with an excess of such holes or with such holes in critical locations shall not be used. Exposed surfaces and edges shall be kept clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Stained, discolored, or damaged sheets shall be removed from the site.

##### 3.1.1 Roofing

Side laps shall be laid away from the prevailing winds. Side and end lap distances, joint sealing, and fastening and spacing of fasteners shall be in accordance with manufacturer's standard practice. Spacing of exposed fasteners shall present an orderly appearance. Side laps and end laps of roof panels and joints at accessories shall be sealed. Fasteners shall be driven normal to the surface. Method of applying joint sealant shall conform to the manufacturer's recommendation to achieve a complete weathertight installation. Accessories shall be fastened into substrate, except as otherwise approved. Closure strips shall be provided as indicated and where necessary to provide weathertight construction.

##### 3.1.2 Field Forming of Roof Panels for Unique Areas

When roofing panels are formed from factory-color-finished steel coils at

the project site, the same care and quality control measures that are taken in shop forming of roofing panels shall be observed. Rollformer shall be operated by the metal roofing manufacturer's approved installer. In cold weather conditions, preheating of the steel coils to be field formed shall be performed as necessary just prior to the rolling operations.

### 3.1.3 Underlayment

Underlayment types shall be installed where shown on the drawings; they shall be installed directly over the substrate. If a roof panel rests directly on the underlayments, a slip sheet shall be installed as a top layer, beneath the metal roofing panels, to prevent adhesion. All underlayments shall be installed so that successive strips overlap the next lower strip in shingle fashion. Underlayments shall be installed in accordance with the manufacturer's written instructions. The underlayments shall ensure that any water that penetrates below the metal roofing panels will drain outside of the building envelope.

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
NON-STRUCTURAL METAL ROOF SYSTEM

FACILITY DESCRIPTION\_\_\_\_\_

BUILDING NUMBER:\_\_\_\_\_

CORPS OF ENGINEERS CONTRACT NUMBER:\_\_\_\_\_

CONTRACTOR

CONTRACTOR:\_\_\_\_\_

ADDRESS:\_\_\_\_\_

POINT OF CONTACT:\_\_\_\_\_

TELEPHONE NUMBER:\_\_\_\_\_

OWNER

OWNER:\_\_\_\_\_

ADDRESS:\_\_\_\_\_

POINT OF CONTACT:\_\_\_\_\_

TELEPHONE NUMBER:\_\_\_\_\_

CONSTRUCTION AGENT

CONSTRUCTION AGENT:\_\_\_\_\_

ADDRESS:\_\_\_\_\_

POINT OF CONTACT:\_\_\_\_\_

TELEPHONE NUMBER:\_\_\_\_\_

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
NON-STRUCTURAL METAL ROOF SYSTEM  
(continued)

THE NON-STRUCTURAL METAL ROOF SYSTEM INSTALLED ON THE ABOVE NAMED BUILDING IS WARRANTED BY \_\_\_\_\_ FOR A PERIOD OF FIVE (5) YEARS AGAINST WORKMANSHIP AND MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE, AND LEAKAGE. THE NON-STRUCTURAL METAL ROOFING SYSTEM COVERED UNDER THIS WARRANTY SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO, THE FOLLOWING: THE ENTIRE ROOFING SYSTEM, MANUFACTURER SUPPLIED FRAMING AND STRUCTURAL MEMBERS, METAL ROOF PANELS, FASTENERS, CONNECTORS, ROOF SECUREMENT COMPONENTS, AND ASSEMBLIES TESTED AND APPROVED IN ACCORDANCE WITH UL 580. IN ADDITION, THE SYSTEM PANEL FINISHES, SLIP SHEET, INSULATION, VAPOR RETARDER, ALL ACCESSORIES, COMPONENTS, AND TRIM AND ALL CONNECTIONS ARE INCLUDED. THIS INCLUDES ROOF PENETRATION ITEMS SUCH AS VENTS, CURBS, SKYLIGHTS; INTERIOR OR EXTERIOR GUTTERS AND DOWNSPOUTS; EAVES, RIDGE, HIP, VALLEY, RAKE, GABLE, WALL, OR OTHER ROOF SYSTEM FLASHINGS INSTALLED AND ANY OTHER COMPONENTS SPECIFIED WITHIN THIS CONTRACT TO PROVIDE A WEATHERTIGHT ROOF SYSTEM; AND ITEMS SPECIFIED IN OTHER SECTIONS OF THE SPECIFICATIONS THAT ARE PART OF THE NON-STRUCTURAL METAL ROOFING SYSTEM.

ALL MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE, AND LEAKAGE ASSOCIATED WITH THE NON-STRUCTURAL METAL ROOF SYSTEM COVERED UNDER THIS WARRANTY SHALL BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER. THIS WARRANTY SHALL COVER THE ENTIRE COST OF REPAIR OR REPLACEMENT, INCLUDING ALL MATERIAL, LABOR, AND RELATED MARKUPS. THE ABOVE REFERENCED WARRANTY COMMENCED ON THE DATE OF FINAL ACCEPTANCE ON \_\_\_\_\_ AND WILL REMAIN IN EFFECT FOR STATED DURATION FROM THIS DATE.

SIGNED, DATED, AND NOTARIZED (BY COMPANY PRESIDENT)

\_\_\_\_\_  
(Company President)

\_\_\_\_\_  
(Date)



CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
NON-STRUCTURAL METAL ROOFING SYSTEM  
(continued)

THE CONTRACTOR SHALL SUPPLEMENT THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE MANUFACTURER AND/OR INSTALLER OF THE NON-STRUCTURAL METAL ROOFING SYSTEM, WHICH SHALL BE SUBMITTED ALONG WITH THE CONTRACTOR'S WARRANTY. HOWEVER, THE CONTRACTOR WILL BE ULTIMATELY RESPONSIBLE FOR THIS WARRANTY AS OUTLINED IN THE SPECIFICATIONS AND AS INDICATED IN THIS WARRANTY EXAMPLE.

EXCLUSIONS FROM COVERAGE

1. NATURAL DISASTERS, ACTS OF GOD (LIGHTNING, FIRE, EXPLOSIONS, SUSTAINED WIND FORCES IN EXCESS OF THE DESIGN CRITERIA, EARTHQUAKES, AND HAIL).
2. ACTS OF NEGLIGENCE OR ABUSE OR MISUSE BY GOVERNMENT OR OTHER PERSONNEL, INCLUDING ACCIDENTS, VANDALISM, CIVIL DISOBEDIENCE, WAR, OR DAMAGE CAUSED BY FALLING OBJECTS.
3. CORROSION CAUSED BY EXPOSURE TO CORROSIVE CHEMICALS, ASH OR FUMES GENERATED OR RELEASED INSIDE OR OUTSIDE THE BUILDING FROM CHEMICAL PLANTS, FOUNDRIES, PLATING WORKS, KILNS, FERTILIZER FACTORIES, PAPER PLANTS, AND THE LIKE.
4. FAILURE OF ANY PART OF THE NON-STRUCTURAL METAL ROOF DUE TO ACTIONS BY THE OWNER TO INHIBIT FREE DRAINAGE OF WATER FROM THE ROOF AND GUTTERS AND DOWNSPOUTS OR ALLOW PONDING WATER TO COLLECT ON THE ROOF SURFACE. CONTRACTOR'S DESIGN SHALL INSURE FREE DRAINAGE FROM THE ROOF AND NOT ALLOW PONDING WATER.
5. THIS WARRANTY APPLIES TO THE NON-STRUCTURAL METAL ROOFING SYSTEM. IT DOES NOT INCLUDE ANY CONSEQUENTIAL DAMAGE TO THE BUILDING INTERIOR OR CONTENTS WHICH IS COVERED BY THE WARRANTY OF CONSTRUCTION CLAUSE INCLUDED IN THIS CONTRACT.
6. THIS WARRANTY CANNOT BE TRANSFERRED TO ANOTHER OWNER WITHOUT WRITTEN CONSENT OF THE CONTRACTOR; AND THIS WARRANTY AND THE CONTRACT PROVISIONS WILL TAKE PRECEDENCE OVER ANY CONFLICTS WITH STATE STATUTES.

\*\*

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
NON-STRUCTURAL METAL ROOF SYSTEM  
(continued)

\*\*REPORTS OF LEAKS AND ROOF SYSTEM DEFICIENCIES SHALL BE RESPONDED TO WITHIN 48 HOURS OF RECEIPT OF NOTICE, BY TELEPHONE OR IN WRITING, FROM EITHER THE OWNER OR CONTRACTING OFFICER. EMERGENCY REPAIRS TO PREVENT FURTHER ROOF LEAKS SHALL BE INITIATED IMMEDIATELY; A WRITTEN PLAN SHALL BE SUBMITTED FOR APPROVAL TO REPAIR OR REPLACE THIS ROOF SYSTEM WITHIN SEVEN (7) CALENDAR DAYS. ACTUAL WORK FOR PERMANENT REPAIRS OR REPLACEMENT SHALL BE STARTED WITHIN 30 DAYS AFTER RECEIPT OF NOTICE, AND COMPLETED WITHIN A REASONABLE TIME FRAME. IF THE CONTRACTOR FAILS TO ADEQUATELY RESPOND TO THE WARRANTY PROVISIONS, AS STATED IN THE CONTRACT AND AS CONTAINED HEREIN, THE CONTRACTING OFFICER MAY HAVE THE NON-STRUCTURAL METAL ROOF SYSTEM REPAIRED OR REPLACED BY OTHERS AND CHARGE THE COST TO THE CONTRACTOR.

IN THE EVENT THE CONTRACTOR DISPUTES THE EXISTENCE OF A WARRANTABLE DEFECT, THE CONTRACTOR MAY CHALLENGE THE OWNER'S DEMAND FOR REPAIRS AND/OR REPLACEMENT DIRECTED BY THE OWNER OR CONTRACTING OFFICER EITHER BY REQUESTING A CONTRACTING OFFICER'S DECISION UNDER THE CONTRACT DISPUTES ACT, OR BY REQUESTING THAT AN ARBITRATOR RESOLVE THE ISSUE. THE REQUEST FOR AN ARBITRATOR MUST BE MADE WITHIN 48 HOURS OF BEING NOTIFIED OF THE DISPUTED DEFECTS. UPON BEING INVOKED, THE PARTIES SHALL, WITHIN TEN (10) DAYS, JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES SHALL CONFER WITHIN TEN (10) DAYS AFTER RECEIPT OF THE LIST TO SEEK AGREEMENT ON AN ARBITRATOR. IF THE PARTIES CANNOT AGREE ON AN ARBITRATOR, THE CONTRACTING OFFICER AND THE PRESIDENT OF THE CONTRACTOR'S COMPANY WILL STRIKE ONE (1) NAME FROM THE LIST ALTERNATIVELY UNTIL ONE (1) NAME REMAINS. THE REMAINING PERSON SHALL BE THE DULY SELECTED ARBITRATOR. THE COSTS OF THE ARBITRATION, INCLUDING THE ARBITRATOR'S FEE AND EXPENSES, COURT REPORTER, COURTROOM OR SITE SELECTED, ETC., SHALL BE BORNE EQUALLY BETWEEN THE PARTIES. EITHER PARTY DESIRING A COPY OF THE TRANSCRIPT SHALL PAY FOR THE TRANSCRIPT. A HEARING WILL BE HELD AS SOON AS THE PARTIES CAN MUTUALLY AGREE. A WRITTEN ARBITRATOR'S DECISION WILL BE REQUESTED NOT LATER THAN 30 DAYS FOLLOWING THE HEARING. THE DECISION OF THE ARBITRATOR WILL NOT BE BINDING; HOWEVER, IT WILL BE ADMISSIBLE IN ANY SUBSEQUENT APPEAL UNDER THE CONTRACT DISPUTES ACT.

A FRAMED COPY OF THIS WARRANTY SHALL BE POSTED IN THE MECHANICAL ROOM OR OTHER APPROVED LOCATION DURING THE ENTIRE WARRANTY PERIOD.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 07 - THERMAL & MOISTURE PROTECTION

SECTION 07600

SHEET METALWORK, GENERAL

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL REQUIREMENTS
- 1.3 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Metal Drip Edge, Fascia, Miscellaneous Flashings, and Snow Guards
  - 2.1.2 Scupper and Conductor Head
  - 2.1.3 Gutters and Downspouts
  - 2.1.4 Copper Ridge Crest
  - 2.1.5 Miscellaneous Flashing
  - 2.1.6 Soffit Panels
  - 2.1.7 Fabrication
  - 2.1.8 Accessories
  - 2.1.9 Aluminum Extrusions
  - 2.1.10 Bituminous Cement
  - 2.1.11 Sealant
  - 2.1.12 Fasteners
  - 2.1.13 Felt
  - 2.1.14 Polyvinyl Chloride (PVC) Reglets
  - 2.1.15 Aluminum Alloy Sheet and Plate
  - 2.1.16 Copper
  - 2.1.17 Stainless Steel
  - 2.1.18 Solder
  - 2.1.19 Through-Wall Flashing
  - 2.1.20 Louver Screen
- 2.2 COLOR

PART 3 EXECUTION

- 3.1 GENERAL REQUIREMENTS
- 3.2 PROTECTION OF ALUMINUM
  - 3.2.1 Paint
  - 3.2.2 Nonabsorptive Tape or Gasket
- 3.3 CONNECTIONS AND JOINTING
  - 3.3.1 Soldering
  - 3.3.2 Riveting
  - 3.3.3 Seaming
- 3.4 CLEATS
- 3.5 FLASHINGS
  - 3.5.1 Counter Flashings
  - 3.5.2 Stepped Flashing

Grand Forks Phase 2 Levees

- 3.5.3 Through-Wall Flashing
  - 3.5.3.1 Lintel Flashing
- 3.5.4 Valley Flashing
- 3.5.5 Installation of Louvers
- 3.6 CONTRACTOR QUALITY CONTROL

-- End of Section Table of Contents --

SECTION 07600

SHEET METALWORK, GENERAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |  |
|-------------|--|
| ASTM A 167  | (1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip                        |
| ASTM B 32   | (1996) Solder Metal  |
| ASTM B 209M | (1995) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)  |
| ASTM B 221M | (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)               |
| ASTM B 370  | (1998) Copper Sheet and Strip for Building Construction  |
| ASTM D 226  | (1997a) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing                                 |
| ASTM D 1784 | (1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds |
| ASTM D 2822 | (1991; R 1997e1) Asphalt Roof Cement   |
| ASTM D 4022 | (1994) Coal Tar Roof Cement, Asbestos Containing   |
| ASTM D 4586 | (1993) Asphalt Roof Cement, Asbestos Free  |

INSECT SCREENING WEAVERS ASSOCIATION (ISWA)

|              |   |
|--------------|---|
| ISWA IWS 089 | (1990) Recommended Standards and Specifications for Insect Wire Screening (Wire Fabric) |
|--------------|---|

SHEET METAL & AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA)

|                     |                                  |
|---------------------|----------------------------------|
| SMACNA Arch. Manual | (1993; Errata; Addenda Oct 1997) |
|---------------------|----------------------------------|

## Architectural Sheet Metal Manual

### 1.2 GENERAL REQUIREMENTS

Sheet metalwork shall be accomplished to form weathertight construction without waves, warps, buckles, fastening stresses or distortion, and shall allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Installation of sheet metal items used in conjunction with roofing shall be coordinated with roofing work to permit continuous roofing operations. Sheet metalwork pertaining to heating, ventilating, and air conditioning is specified in Section 15500 HEATING, VENTILATION, AND AIR-CONDITIONING SYSTEMS.

### 1.3 DELIVERY, STORAGE, AND HANDLING

Materials shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness, and wet-storage stains upon delivery to the jobsite. Materials shall be clearly labeled as to type and manufacturer. Sheet metal items shall be carefully handled to avoid damage. Materials shall be stored in dry, ventilated areas until immediately before installation.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Lead, lead-coated metal, and galvanized steel shall not be used. Any metal listed by SMACNA Arch. Manual for a particular item may be used, unless otherwise specified or indicated. Materials shall conform to the requirements specified below and to the thicknesses and configurations established in SMACNA Arch. Manual. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items shall be copper.

#### 2.1.1 Metal Drip Edge, Fascia, Miscellaneous Flashings, and Snow Guards

Material shall be 0.040 inch aluminum or 16 ounce copper where noted. Aluminum finish shall be factory-applied "Kynar 500" PVF coating, or equal. Continuous concealed clip shall be same material as fascia. Provide fasteners of correct length and type. Fabricate to profiles shown or required.

#### 2.1.2 Scupper and Conductor Head

Type shall be similar to "Scupper Design and Installation," Figure 1-26, page 1.59, SMACNA Arch. Manual and as shown on drawings. Material shall be 0.040 inch aluminum. Finish shall be factory-applied "Kynar 500" PVF coating, or equal. Provide necessary fasteners, hangers and accessories.

#### 2.1.3 Gutters and Downspouts

Material shall be 0.032 inch prefinished aluminum or 16 ounce copper, ASTM B 370 cold rolled tempered. Ogee design. Provide necessary clips, fasteners, hangers and accessories. Aluminum finish shall be factory-applied "Kynar 500" PVF coating, or equal.

#### 2.1.4 Copper Ridge Crest

Fabricate to design shown, complete with nailing flanges and fasteners.

#### 2.1.5 Miscellaneous Flashing

Base flashing, counterflashings, roof penetration flashings, and miscellaneous flashings as shown on drawings. Material shall be 0.032 inch aluminum; same finish as adjacent construction.

#### 2.1.6 Soffit Panels

Type: prefinished aluminum vented where noted. Manufacturer's standard panel design. Furnish all clips, mouldings, and trim. Color shall be white, unless indicated otherwise in Color Schedule.

#### 2.1.7 Fabrication

Form sections true to shape, accurate in size, square, and free from distortion or defects. Hem exposed edges on underside 1/2 inch; miter and seam corners. Weld aluminum seams.

#### 2.1.8 Accessories

Accessories and other items essential to complete the sheet metal installation, though not specifically indicated or specified, shall be provided. Fastener shall be stainless steel, aluminum, or galvanized steel. Finish exposed fasteners same as adjacent construction.

#### 2.1.9 Aluminum Extrusions

ASTM B 221M, Alloy 6063, Temper T5.

#### 2.1.10 Bituminous Cement

Type I asphalt cement conforming to ASTM D 2822 or ASTM D 4586. For coal tar roofing; coal tar cement conforming to ASTM D 4022.

#### 2.1.11 Sealant

Unless otherwise specified, sealant shall be an elastomeric weather resistant sealant as specified in Section 07900 JOINT SEALING.

#### 2.1.12 Fasteners

Fasteners shall be compatible with the fastened material and shall be the type best suited for the application.

#### 2.1.13 Felt

ASTM D 226, Type I.

#### 2.1.14 Polyvinyl Chloride (PVC) Reglets

ASTM D 1784, Class 14333D, 0.075 inch minimum thickness.

#### 2.1.15 Aluminum Alloy Sheet and Plate

ASTM B 209M, anodized clear form, alloy, and temper appropriate for use.

#### 2.1.16 Copper

## Grand Forks Phase 2 Levees

ASTM B 370, Temper H 00.

### 2.1.17 Stainless Steel

ASTM A 167, Type 302 or 304; fully annealed, dead soft temper.

### 2.1.18 Solder

ASTM B 32, 95-5 tin-antimony.

### 2.1.19 Through-Wall Flashing

- a. Stainless steel, Type 304, not less than 0.003 inch thick, completely encased by and permanently bonded on both sides to 50 pound high strength bituminized crepe kraft paper, using hot asphalt, heat, and pressure.
- b. Three ounce copper sheet, with 2 mils of dense, clear, polyethylene sheet bonded to each side of the copper.

### 2.1.20 Louver Screen

Louver screen shall be Type III aluminum alloy insect screening conforming to ISWA IWS 089.

## 2.2 COLOR

Flashing colors shall be in accordance with Section 09915 COLOR SCHEDULE.

## PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

Louvers shall be fabricated in conformance with SMACNA Arch. Manual and as indicated. Unless otherwise specified or indicated, exposed edges shall be folded back to form a 1/2 inch hem on the concealed side, and bottom edges of exposed vertical surfaces shall be angled to form drips. Bituminous cement shall not be placed in contact with roofing membranes other than built-up roofing.

### 3.2 PROTECTION OF ALUMINUM

Aluminum shall not be used where it will be in contact with copper or where it will contact water which flows over copper surfaces. Aluminum that will be in contact with wet or pressure-treated wood, mortar, concrete, masonry, or ferrous metals shall be protected against galvanic or corrosive action by one of the following methods:

#### 3.2.1 Paint

Aluminum surfaces shall be solvent cleaned and given one coat of zinc-molybdate primer and one coat of aluminum paint as specified in Section 09900 PAINTING, GENERAL.

#### 3.2.2 Nonabsorptive Tape or Gasket

Nonabsorptive tape or gasket shall be placed between the adjoining surfaces and cemented to the aluminum surface using a cement compatible with



aluminum.

### 3.3 CONNECTIONS AND JOINTING

#### 3.3.1 Soldering

Soldering shall apply to copper, and stainless steel items. Edges of sheet metal shall be pretinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of stainless steel to be pretinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a water solution of washing soda and rinsed with clean water.

#### 3.3.2 Riveting

Joints in aluminum sheets 0.040 inch or less in thickness shall be mechanically made.

#### 3.3.3 Seaming

Flat-lock and soldered-lap seams shall finish not less than 1 inch wide. Unsoldered plain-lap seams shall lap not less than 3 inches unless otherwise specified. Flat seams shall be made in the direction of the flow.

### 3.4 CLEATS

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints of cleats shall be spaced approximately 1/8 inch apart. The cleat shall be fastened to supporting wood construction with nails evenly spaced not over 12 inches on centers. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry.

### 3.5 FLASHINGS

Flashings shall be installed at locations indicated and as specified below. Sealing shall be according to the flashing manufacturer's recommendations. Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof, and floor drains, and for electrical conduit projections through roof or walls are specified in other sections. Except as otherwise indicated, counter flashings shall be provided over base flashings. Perforations in flashings made by masonry anchors shall be covered up by an application of bituminous plastic cement at the perforation. Flashing shall be installed on top of joint reinforcement. Flashing shall be formed to direct water to the outside of the system.

#### 3.5.1 Counter Flashings

Except as otherwise indicated, counter flashings shall be provided over base flashings. Counter flashing shall be installed as shown on the drawings. Counter flashing shall be factory formed to provide spring action against the base flashing.

#### 3.5.2 Stepped Flashing

Stepped flashing shall be installed where sloping roofs surfaced with shingles abut vertical surfaces. Separate pieces of base flashing shall be placed in alternate shingle courses.

### 3.5.3 Through-Wall Flashing

Through-wall flashing includes sill, lintel, and spandrel flashing. The flashing shall be laid with a layer of mortar above and below the flashing so that the total thickness of the two layers of the mortar and flashing are the same thickness as the regular mortar joints. Flashing shall not extend further into the masonry backup wall than the first mortar joint. Joints in flashing shall be lapped and sealed. Flashing shall be one piece for lintels and sills.

#### 3.5.3.1 Lintel Flashing

Lintel flashing shall extend the full length of lintel. Flashing shall extend through the wall one masonry course above the lintels and shall be bent down over the vertical leg of the outer steel lintel angle not less than 2 inches, or shall be applied over top of masonry and precast concrete lintels. Bedjoints of lintels at control joints shall be underlaid with sheet metal bond breaker.

### 3.5.4 Valley Flashing

Valley flashing shall be installed as specified in SMACNA Arch. Manual and as indicated.

### 3.5.5 Installation of Louvers

Louvers shall be rigidly attached to the supporting construction. The installation shall be raintight. Louver screen shall be installed as indicated.

## 3.6 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain a quality control procedure for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.
- b. Verification of compliance of materials before, during, and after installation.
- c. Inspection of sheet metalwork for proper size and thickness, fastening and joining, and proper installation.

The actual quality control observations and inspections shall be documented and a copy of the documentation furnished to the Contracting Officer at the end of each day.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 07 - THERMAL & MOISTURE PROTECTION

SECTION 07720

ROOF VENTILATORS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 DESIGN REQUIREMENTS
- 1.3 QUALIFICATION
- 1.4 DELIVERY, STORAGE AND HANDLING
- 1.5 PROJECT/SITE CONDITIONS

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Aluminum Extrusions
  - 2.1.2 Aluminum Sheets
- 2.2 STATIONARY VENTILATORS
- 2.3 RIDGE VENT
- 2.4 FABRICATION
- 2.5 SCREENS

PART 3 EXECUTION

- 3.1 PREPARATION
- 3.2 INSTALLATION
- 3.3 PROTECTION

-- End of Section Table of Contents --

SECTION 07720

ROOF VENTILATORS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 209M (1995) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

ASTM B 221M (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (1995) Minimum Design Loads for Buildings & Other Structures

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA Arch. Manual (1993; Errata; Addenda Oct 1997)  
Architectural Sheet Metal Manual

1.2 DESIGN REQUIREMENTS

Ventilators shall be designed for use with the specific type of project roofing system, and shall provide uniform and continuous air flow. Ventilator design shall provide protection against rain and snow, and shall be provided with a continuous weep along the bottom of both sides of wind band. Units shall be self-cleaning by the action of the elements, and shall have provisions for carrying water and normal wind-transported soil matter to the outside. Units shall be designed for windspeeds of not less than 80 mph in accordance with ASCE 7. Ventilators shall be free of internal obstructions or moving parts which will require maintenance, and shall be complete with type of mounting indicated on drawings.

1.3 QUALIFICATION

Manufacturer shall specialize in design and manufacture of the type of roof ventilators specified in this section, and shall have a minimum of 3 years of documented successful experience. Ventilator installer shall be experienced in the installation of ventilator types specified.

1.4 DELIVERY, STORAGE AND HANDLING

## Grand Forks Phase 2 Levees

Roof ventilators shall be cartoned or crated prior to shipment. Ventilators shall be protected from moisture and damage. Damaged items shall be removed from site.

### 1.5 PROJECT/SITE CONDITIONS

Rough openings shall be field-measured and recorded on shop drawings prior to fabrication of roof ventilators. Fabrication shall be scheduled with construction schedule.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 Aluminum Extrusions

Aluminum extrusions shall be alloy 6063, temper T5 in compliance with ASTM B 221M.

#### 2.1.2 Aluminum Sheets

Aluminum sheets shall be alloy 5005, temper H15 or alloy 3003, temper H14 in compliance with ASTM B 209M.

### 2.2 STATIONARY VENTILATORS

Stationary roof ventilators shall be fabricated of aluminum with seamless spun conical-shaped weathercap, and shall have straight-through drainage for eliminating the possibility of air-borne debris collecting in the ventilator openings. Insect screens shall be provided.

### 2.3 RIDGE VENT

Fabricate of 0.019 inch thick sheet aluminum with baffles to prevent snow and rain entering and weepholes to allow water to drain to roof. Vent shall have minimum net free area of 16 square inches per linear feet. Provide splice plates and end caps as required.

### 2.4 FABRICATION

Welds, soldered seams, rivets and fasteners shall be clean, secure, watertight, and smooth. Edges shall be wired or beaded, where necessary, to ensure rigidity. Joints between sections shall be watertight and shall allow for expansion and contraction. Galvanic action between different metals in direct contact shall be prevented by nonconductive separators.

### 2.5 SCREENS

Screens shall be furnished by ventilator manufacturer as part of ventilator assembly. Screen (with frames) shall be manufactured of material to match ventilators, and shall be designed to be easily removed for cleaning purposes.

## PART 3 EXECUTION

### 3.1 PREPARATION

Rough openings and other roof conditions shall be prepared in accordance with approved shop drawings and manufacturer's recommendations. Before

starting the ventilator work, surrounding roof surfaces shall be protected from damage.

### 3.2 INSTALLATION

Roof ventilator installation shall be coordinated with roofing work, and shall be installed in accordance with approved shop drawings, manufacturer's published instructions, and chapter 8 of SMACNA Arch. Manual.

The ventilator installation shall be watertight and shall be free of vibration noise. Aluminum surfaces shall be protected from direct contact with incompatible materials. Aluminum surfaces which will be in contact with sealant shall not be coated with a protective material. Aluminum shall not be used with copper or with water which flows over copper surfaces. Roof ventilators shall be cleaned in accordance with ventilator manufacturer's recommendations.

### 3.3 PROTECTION

Exposed ventilator finish surfaces shall be protected against the accumulation of paint, grime, mastic, disfigurement, discoloration and damage for duration of construction activities.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 07 - THERMAL & MOISTURE PROTECTION

SECTION 07900

JOINT SEALING

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 ENVIRONMENTAL REQUIREMENTS
- 1.4 DELIVERY AND STORAGE

PART 2 PRODUCTS

- 2.1 BACKING
  - 2.1.1 Rubber
  - 2.1.2 Synthetic Rubber
  - 2.1.3 Neoprene
- 2.2 BOND-BREAKER
- 2.3 PRIMER
- 2.4 SEALANT
  - 2.4.1 Elastomeric
  - 2.4.2 Toilet Room Sealant
- 2.5 SOLVENTS AND CLEANING AGENTS

PART 3 EXECUTION

- 3.1 GENERAL
  - 3.1.1 Surface Preparation
  - 3.1.2 Concrete and Masonry Surfaces
  - 3.1.3 Steel Surfaces
  - 3.1.4 Aluminum Surfaces
  - 3.1.5 Wood Surfaces
- 3.2 APPLICATION
  - 3.2.1 Masking Tape
  - 3.2.2 Backing
  - 3.2.3 Bond-Breaker
  - 3.2.4 Primer
  - 3.2.5 Sealant
- 3.3 CLEANING

-- End of Section Table of Contents --

SECTION 07900

JOINT SEALING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |   |
|-------------|---|
| ASTM C 509  | (1994) Elastomeric Cellular Preformed Gasket and Sealing Material |
| ASTM C 920  | (1998) Elastomeric Joint Sealants                                 |
| ASTM D 1056 | (1998) Flexible Cellular Materials - Sponge or Expanded Rubbe     |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Sealant; G .

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). A copy of the Material Safety Data Sheet shall be provided for each solvent, primer or sealant material. Include color charts for color selection.

1.3 ENVIRONMENTAL REQUIREMENTS

The ambient temperature shall be within the limits of 40 to 90 degrees F when the sealants are applied.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the job in the manufacturer's original unopened containers. The container label or accompanying data sheet shall include the following information as applicable: manufacturer, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time at the standard conditions for laboratory tests. Materials shall be handled and stored to prevent inclusion of foreign materials. Materials shall be stored at temperatures between 40 and 90 degrees F unless otherwise specified by the manufacturer.



## PART 2 PRODUCTS

### 2.1 BACKING

Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated.

#### 2.1.1 Rubber

Cellular rubber sponge backing shall be ASTM D 1056, Type 2, closed cell, Class A, round cross section.

#### 2.1.2 Synthetic Rubber

Synthetic rubber backing shall be ASTM C 509, Option I, Type I preformed rods or tubes.

#### 2.1.3 Neoprene

Neoprene backing shall be ASTM D 1056, closed cell expanded neoprene cord Type 2, Class C, Grade 2C2.

### 2.2 BOND-BREAKER

Bond-breaker shall be as recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

### 2.3 PRIMER

Primer shall be non-staining type as recommended by sealant manufacturer for the application.

### 2.4 SEALANT

#### 2.4.1 Elastomeric

Elastomeric sealants shall conform to ASTM C 920 and the following:

- a. Polyurethane sealant: Grade NS, Class 12.5, Use NT.

#### 2.4.2 Toilet Room Sealant

For plumbing fixtures, provide white silicone rubber, mildew-resistant; GE SCS 1702, Dow Corning 786, or approved equal.

### 2.5 SOLVENTS AND CLEANING AGENTS

Solvents, cleaning agents, and accessory materials shall be provided as recommended by the manufacturer.

## PART 3 EXECUTION

### 3.1 GENERAL

#### 3.1.1 Surface Preparation

The surfaces of joints to receive sealant or caulk shall be free of all frost, condensation and moisture. Oil, grease, dirt, chalk, particles of

mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from surfaces of joints to be in contact with the sealant.

Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths. For surface types not listed below, the sealant manufacturer shall be contacted for specific recommendations.

### 3.1.2 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

### 3.1.3 Steel Surfaces

Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

### 3.1.4 Aluminum Surfaces

Aluminum surfaces to be in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coating shall be as recommended by the manufacturer of the aluminum work and shall be non-staining.

### 3.1.5 Wood Surfaces

Wood surfaces to be in contact with sealants shall be free of splinters and sawdust or other loose particles.

## 3.2 APPLICATION

### 3.2.1 Masking Tape

Masking tape may be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

### 3.2.2 Backing

Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.

### 3.2.3 Bond-Breaker

Bond-breaker shall be applied to fully cover the bottom of the joint without contaminating the sides where sealant adhesion is required.

### 3.2.4 Primer

Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces

adjacent to joints shall not be primed.

### 3.2.5 Sealant

Sealant shall be used before expiration of shelf life. Multi-component sealants shall be mixed according to manufacturer's printed instructions. Sealant in guns shall be applied with a nozzle of proper size to fit the width of joint. Sealant shall be forced into joints with sufficient pressure to expel air and fill the groove solidly. Sealant shall be installed to the indicated depth without displacing the backing. Unless otherwise indicated, specified, or recommended by the manufacturer, the installed sealant shall be dry tooled to produce a uniformly smooth surface free of wrinkles and to ensure full adhesion to the sides of the joint; the use of solvents, soapy water, etc., will not be allowed. Sealants shall be installed free of air pockets, foreign embedded matter, ridges and sags. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

### 3.3 CLEANING

The surfaces adjoining the sealed joints shall be cleaned of smears and other soiling resulting from the sealant application as work progresses.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 08 - DOORS & WINDOWS

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY AND STORAGE
- 1.4 WARRANTY

PART 2 PRODUCTS

- 2.1 DOORS AND FRAMES
- 2.2 THERMAL INSULATED DOORS
- 2.3 WEATHERSTRIPPING
- 2.4 TRANSOM AND SIDELIGHT PANELS
- 2.5 DOOR LOUVERS (GRILLE)
- 2.6 FACTORY FINISH

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Thermal Insulated Doors
- 3.2 FIELD PAINTED FINISH

-- End of Section Table of Contents --

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A250.8 (1998) Steel Doors and Frames

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 236 (1989; R 1993) Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box

ASTM C 976 (1990; R 1996) Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box

ASTM D 2863 (1997) Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

ASTM E 283 (1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

DOOR AND HARDWARE INSTITUTE (DHI)

DHI A115.1G (1994) Installation Guide for Doors and Hardware

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80 (1999) Fire Doors and Fire Windows

NFPA 80A (1996) Protection of Buildings from Exterior Fire Exposures

NFPA 101 (1997; Errata 97-1; TIA 97-1) Life Safety Code

STEEL DOOR INSTITUTE (SDOI)

SDOI SDI-106 (1996) Standard Door Type Nomenclature

SDOI SDI-107

(1997) Hardware on Steel Doors  
(Reinforcement - Application)

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Doors; GA

Drawings using standard door type nomenclature in accordance with SDOI SDI-106 indicating the location of each door and frame, elevation of each model of door and frame, details of construction, method of assembling sections, location and extent of hardware reinforcement, hardware locations, type and location of anchors for frames, and thicknesses of metal. Drawings shall include catalog cuts or descriptive data for the doors, frames, and weatherstripping including air infiltration data and manufacturers printed instructions.

## 1.3 DELIVERY AND STORAGE

During shipment, welded unit type frames shall be strapped together in pairs with heads at opposite ends or shall be provided with temporary steel spreaders at the bottom of each frame. Materials shall be delivered to the site in undamaged condition, and stored out of contact with the ground and under a weathertight covering permitting air circulation. Doors and assembled frames shall be stored in an upright position in accordance with DHI A115.1G. Abraded, scarred, or rusty areas shall be cleaned and touched up with matching finishes.

## 1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties shall be provided.

## PART 2 PRODUCTS

### 2.1 DOORS AND FRAMES

Doors and frames shall be factory fabricated in accordance with ANSI A250.8 and the additional requirements specified herein. Door grade shall be heavy duty (Grade II) unless otherwise indicated on the door and door frame schedules. Exterior doors and frames shall be designation G60 galvanized. Interior doors and frames shall be designation G60 galvanized. Doors and frames shall be prepared to receive hardware conforming to the templates and information provided under Section 08700 BUILDERS' HARDWARE. Doors and frames shall be reinforced, drilled, and tapped to receive mortised hinges, locks, latches, and flush bolts as required. Doors and frames shall be reinforced for surface applied hardware. Frames shall be welded type. Door frames shall be furnished with a minimum of three jamb anchors and one floor anchor per jamb. Anchors shall be not less than 18 gauge steel or 7 gauge diameter wire. For wall conditions that do not allow the use of a floor anchor, an additional jamb anchor shall be provided. Rubber silencers shall be furnished for installation into factory predrilled holes in door frames; adhesively applied silencers are not acceptable. Where frames are installed in masonry walls, plaster guards shall be provided on door frames

at hinges and strikes. Reinforcing of door assemblies for closers and other required hardware shall be in accordance with ANSI A250.8. Exterior doors shall have top edges closed flush and sealed against water penetration.

## 2.2 THERMAL INSULATED DOORS

The interior of thermal insulated doors shall be completely filled with rigid plastic foam permanently bonded to each face panel. The thermal conductance (U-value) through the door shall not exceed 0.41 btu/hr times sq f times f when tested as an operational assembly in accordance with ASTM C 236 or ASTM C 976. Doors with cellular plastic cores shall have a minimum oxygen index rating of 22 percent when tested in accordance with ASTM D 2863.

## 2.3 WEATHERSTRIPPING

Unless otherwise specified in Section 08700 BUILDERS' HARDWARE, weatherstripping shall be as follows: Weatherstripping for head and jamb shall be manufacturer's standard elastomeric type of synthetic rubber, vinyl, or neoprene and shall be installed at the factory or on the jobsite in accordance with the door frame manufacturer's recommendations. Weatherstripping for bottom of doors shall be as shown. Air leakage rate of weatherstripping shall not exceed 0.20 cfm per linear foot of crack when tested in accordance with ASTM E 283 at standard test conditions.

## 2.4 TRANSOM AND SIDELIGHT PANELS

Panels for transom and sidelight shall be constructed in accordance with ANSI A250.8. Panels shall be nonremovable from the outside.

## 2.5 DOOR LOUVERS (GRILLE)

Provide door louvers (grilles) of size as indicated; see drawings and schedules. Louvers shall be split-Y, security type. Face plate and frame shall be 12 gauge steel. Louvers shall be 18 gauge steel. Steel shall have prime finish. Include insect screen. Provide Air Louvers Model 1500-A, Anemostat Model PLSL, or approved equal.

## 2.6 FACTORY FINISH

Doors and frames shall be phosphatized and primed with standard factory primer system.

# PART 3 EXECUTION

## 3.1 INSTALLATION

Installation shall be in accordance with DHI A115.1G. Preparation for surface applied hardware shall be in accordance with SDOI SDI-107. Rubber silencers shall be installed in door frames after finish painting has been completed; adhesively applied silencers are not acceptable. Weatherstripping shall be installed at exterior door openings to provide a weathertight installation. Installation and operational characteristics of fire doors shall be in accordance with NFPA 80, NFPA 80A and NFPA 101. Hollow metal door frames shall be solid grouted.

### 3.1.1 Thermal Insulated Doors

Hardware and perimeter seals shall be adjusted for proper operation. Doors shall be sealed weathertight after installation of hardware and shall be in accordance with Section 07900 JOINT SEALING.

3.2 FIELD PAINTED FINISH

Steel doors and frames shall be field painted in accordance with Section 09900 PAINTING, GENERAL. Weatherstrips shall be protected from paint. Finish shall be free of scratches or other blemishes. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 08 - DOORS & WINDOWS

SECTION 08330

OVERHEAD ROLLING DOORS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 DESCRIPTION
  - 1.2.1 Wind Load Requirements
  - 1.2.2 Operational Cycle Life
- 1.3 SUBMITTALS
- 1.4 DELIVERY AND STORAGE
- 1.5 WARRANTY
- 1.6 OPERATION AND MAINTENANCE MANUALS

PART 2 PRODUCTS

- 2.1 OVERHEAD ROLLING DOORS
  - 2.1.1 Curtains
    - 2.1.1.1 Insulated Curtains
  - 2.1.2 Endlocks and Windlocks
  - 2.1.3 Bottom Bar
  - 2.1.4 Guides
  - 2.1.5 Barrel
  - 2.1.6 Springs
  - 2.1.7 Brackets
  - 2.1.8 Hoods
  - 2.1.9 Weatherstripping
  - 2.1.10 Operation
    - 2.1.10.1 Manual Hand-Chain Operation
  - 2.1.11 Locking
  - 2.1.12 Finish

PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 FIELD PAINTED FINISH

-- End of Section Table of Contents --

SECTION 08330

OVERHEAD ROLLING DOORS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- |                   |   |
|-------------------|---|
| ASTM A 653/A 653M | (1999a) Steel Sheet, Zinc-Coated<br>(Galvanized) or Zinc-Iron Alloy-Coated<br>(Galvannealed) by the Hot-Dip Process |
| ASTM E 84         | (1999) Surface Burning Characteristics of<br>Building Materials   |

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING  
ENGINEERS (ASHRAE)

- |                |   |
|----------------|---|
| ASHRAE HDBK-IP | (1997) Handbook, Fundamentals I-P Edition |
| ASHRAE HDBK-SI | (1997) Handbook, Fundamentals SI Editio   |

1.2 DESCRIPTION

Overhead rolling doors shall be spring counterbalanced, rolling type, with interlocking slats, complete with guides, fastenings, hood, brackets, and operating mechanisms, and shall be designed for use on openings as indicated. Each door shall be provided with a permanent label showing the manufacturer's name and address and the model/serial number of the door. Doors in excess of the labelled size shall be deemed oversize and shall be provided with a listing agency oversize label, or a listing agency oversize certificate, or a certificate signed by an official of the manufacturing company certifying that the door and operator have been designed to meet the specified requirements.

1.2.1 Wind Load Requirements

Doors and components shall be designed to withstand the minimum design wind load of 20 psf. Doors shall be constructed to sustain a superimposed load, both inward and outward, equal to 1-1/2 times the minimum design wind load. Recovery shall be at least 3/4 of the maximum deflection within 24 hours after the test load is removed. Sound engineering principles may be used to interpolate or extrapolate test results to door sizes not specifically tested.

1.2.2 Operational Cycle Life

All portions of the door and door operating mechanism that are subject to movement, wear, or stress fatigue shall be designed to operate through a minimum number of 10 cycles per day. One complete cycle of door operation is defined as when the door is in the closed position, moves to the full open position, and returns to the closed position.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-04 Drawings

Overhead Rolling Door Unit; GA.

Drawings showing the location of each door including schedules. Drawings shall include elevations of each door type, details and method of anchorage, details of construction, location and installation of hardware, shape and thickness of materials, details of joints and connections, and details of guides, power operators, controls, and other fittings.

#### SD-19 Operation and Maintenance Manuals

Operation Manual; FIO

Maintenance and Repair Manual; FIO

Six copies of the system operation manual and system maintenance and repair manual for each type of door and control system.

### 1.4 DELIVERY AND STORAGE

Doors shall be delivered to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Doors shall be stored in a dry location that is adequately ventilated and free from dirt and dust, water, and other contaminants, and in a manner that permits easy access for inspection and handling.

### 1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties shall be provided.

### 1.6 OPERATION AND MAINTENANCE MANUALS

The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, troubleshooting guides, and simplified diagrams for the equipment as installed shall be provided. A complete list of parts and supplies, source of supply, and a list of the high mortality maintenance parts shall be provided.

## PART 2 PRODUCTS

### 2.1 OVERHEAD ROLLING DOORS

Doors shall be surface-mounted type with guides at jambs set back a sufficient distance to clear the opening. Exterior doors shall be mounted on interior side of walls.

#### 2.1.1 Curtains

The curtains shall roll up on a barrel supported at the head of opening on brackets, and shall be balanced by helical torsion springs. Steel slats for doors less than 15 feet wide shall be minimum bare metal thickness of 0.0281 inches. Slats shall be of the minimum bare metal decimal thickness required for the width indicated and the wind pressure specified above.

##### 2.1.1.1 Insulated Curtains

The slat system shall supply a minimum R-value of 4 when calculated in accordance with ASHRAE HDBK-IP ASHRAE HDBK-SI. Slats shall be of the flat type as standard with the manufacturer. Slats shall consist of a urethane core not less than 11/16 inch thick, completely enclosed within metal facings. Exterior face of slats shall be gauge as specified for curtains. Interior face shall be not lighter than 0.0219 inches. The insulated slat assembly shall have a flame spread rating of not more than 25 and a smoke development factor of not more than 50 when tested in accordance with ASTM E 84.

#### 2.1.2 Endlocks and Windlocks

The ends of each alternate slat for interior doors shall have endlocks of manufacturer's stock design. In addition to endlocks, non-rated exterior doors shall have the manufacturer's standard windlocks as required to withstand the wind load. Windlocks shall prevent the curtain from leaving guides because of deflection from specified wind pressure.

#### 2.1.3 Bottom Bar

The curtain shall have a standard bottom bar consisting of two hot-dip galvanized steel angles for steel doors.

#### 2.1.4 Guides

Guides shall be steel structural shapes or formed steel shapes, of a size and depth to provide proper clearance for operation and resistance under the design windload. Guides shall be attached to adjoining construction with fasteners recommended by the manufacturer. Spacing of fasteners shall be as required to meet the minimum design windload. Doors and guides in hazardous areas shall have static grounding.

#### 2.1.5 Barrel

The barrel shall be steel pipe or commercial welded steel tubing of proper diameter for the size of curtain. Deflection shall not exceed 0.03 inch per foot of span. Ends of the barrel shall be closed with metal plugs, machined to fit the pipe. Aluminum plugs are acceptable on non-fire door barrels.

#### 2.1.6 Springs

Oil tempered helical steel counter-balance torsion springs shall be installed within the barrel and shall be capable of producing sufficient torque to assure easy operation of the door curtain. Access shall be

provided for spring tension adjustment from outside of the bracket without removing the hood.

#### 2.1.7 Brackets

Brackets shall be of steel plates to close the ends of the roller-shaft housing, and to provide mounting surfaces for the hood. An operation bracket hub and shaft plugs shall have sealed prelubricated ball bearings.

#### 2.1.8 Hoods

Hoods shall be steel with minimum bare metal thickness of 0.0219 inches formed to fit contour of the end brackets, and shall be reinforced with steel rods, rolled beads, or flanges at top and bottom edges. Multiple segment and single piece hoods shall be provided with support brackets of the manufacturer's standard design as required for adequate support.

#### 2.1.9 Weatherstripping

Exterior doors shall be fully weatherstripped. A compressible and replaceable weather seal shall be attached to the bottom bar. Weather seal at door guides shall be continuous vinyl or neoprene, bulb or leaf type, or shall be nylon-brush type. A weather baffle shall be provided at the lintel or inside the hood. Weatherstripping shall be easily replaced without special tools.

#### 2.1.10 Operation

Doors shall be operated by means of manual hand-chain. Equipment shall be designed and manufactured for usage in non-hazardous areas.

##### 2.1.10.1 Manual Hand-Chain Operation

Operation shall be by means of a galvanized endless chain extending to within 3 feet of floor. Reduction shall be provided by use of roller chain and sprocket drive or suitable gearing, to reduce the pull required on hand chain to not over 35 lbf. Gears shall be high grade gray cast iron.

#### 2.1.11 Locking

Locking shall consist of chain lock keeper, suitable for padlock by others, for chain operated doors.

#### 2.1.12 Finish

Steel slats and hoods shall be hot-dip galvanized G60 in accordance with ASTM A 653/A 653M, and shall be treated for paint adhesion and shall receive a factory baked-on prime coat for field finishing. The paint system shall withstand a minimum of 1500 hours without blistering, bubbling, or rust. Surfaces other than slats, hood, and faying surfaces shall be cleaned and treated to assure maximum paint adherence and shall be given a factory dip or spray coat of rust inhibitive metallic oxide or synthetic resin primer. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Doors shall be installed in accordance with approved detail drawings and manufacturer's instructions. Anchors and inserts for guides, brackets, hardware, and other accessories shall be accurately located. Upon completion, doors shall be free from warp, twist, or distortion. Doors shall be lubricated, properly adjusted, and demonstrated to operate freely.

### 3.2 FIELD PAINTED FINISH

Steel doors and frames shall be field painted in accordance with Section 09900 PAINTING, GENERAL. Weatherstrips shall be protected from paint. Finish shall be free of scratches or other blemishes. Color shall be in accordance with Section 09915 COLOR SCHEDULE.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 08 - DOORS & WINDOWS

SECTION 08520

ALUMINUM AND ENVIRONMENTAL CONTROL ALUMINUM WINDOWS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 WINDOW PERFORMANCE
  - 1.2.1 Structural Performance
  - 1.2.2 Air Infiltration
  - 1.2.3 Water Penetration
  - 1.2.4 Thermal Performance
- 1.3 SUBMITTALS
- 1.4 QUALIFICATION
- 1.5 DELIVERY AND STORAGE
- 1.6 WARRANTY

PART 2 PRODUCTS

- 2.1 ALUMINUM WINDOW TYPES
  - 2.1.1 Fixed Half-Round Windows
- 2.2 ACCESSORIES
  - 2.2.1 Fasteners
  - 2.2.2 Window Anchors
- 2.3 GLASS AND GLAZING
- 2.4 FINISH
  - 2.4.1 Anodized Aluminum Finish
  - 2.4.2 Color

PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 ADJUSTMENTS AND CLEANING
  - 3.2.1 Hardware Adjustments
  - 3.2.2 Cleaning

-- End of Section Table of Contents --

SECTION 08520

ALUMINUM AND ENVIRONMENTAL CONTROL ALUMINUM WINDOWS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45 (1997) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 101 (1997) Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 283 (1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM E 330 (1997e1) Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

ASTM E 547 (1996) Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100 (1997) Procedure for Determining Fenestration Product U-factors

NFRC 200 (1997) Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence

1.2 WINDOW PERFORMANCE

Aluminum windows shall meet the following performance requirements. Testing requirements shall be performed by an independent testing laboratory or agency.



#### 1.2.1 Structural Performance

Structural test pressures on window units shall be for positive load (inward) and negative load (outward) in accordance with ASTM E 330. After testing, there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any other damage which could cause window to be inoperable. There shall be no permanent deformation of any main frame, sash or ventilator member in excess of the requirements established by AAMA 101 for the window types and classification specified in this section.

#### 1.2.2 Air Infiltration

Air infiltration shall not exceed the amount established by AAMA 101 for each window type when tested in accordance with ASTM E 283.

#### 1.2.3 Water Penetration

Water penetration shall not exceed the amount established by AAMA 101 for each window type when tested in accordance with ASTM E 547.

#### 1.2.4 Thermal Performance

Thermal transmittance for thermally broken aluminum windows with insulating glass shall not exceed a U-factor of 0.35 Btu/hr-ft<sup>2</sup>-F determined according to NFRC 100. Window units shall comply with the U.S. Department of Energy, Energy Star Window Program for the Northern Climate Zone.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-01 Data

Aluminum Windows; GA

Manufacturer's descriptive data and catalog cut sheets.

Manufacturer's preprinted installation instructions and cleaning instructions.

#### SD-04 Drawings

Aluminum Windows; GA

Drawings indicating elevations of window, rough-opening dimensions for each type and size of window, full-size sections, thicknesses of metal, fastenings, methods of installation and anchorage, connections with other work, type of wall construction, size and spacing of anchors, method of glazing, types and locations of operating hardware, mullion details, weatherstripping details, screen details including method of attachment, window cleaner anchor details, and window schedules showing locations of each window type.

#### SD-09 Reports

Aluminum Windows; GA

Reports for each type of aluminum window attesting that identical windows have been tested and meet all performance requirements established under paragraph WINDOW PERFORMANCE.

SD-13 Certificates

Aluminum Windows; GA

Certificates stating that the aluminum windows are AAMA certified conforming to requirements of this section. Labels or markings permanently affixed to the window will be accepted in lieu of certificates. Product ratings determined using NFRC 100 and NFRC 200 shall be authorized for certification and properly labeled by the manufacturer.

SD-14 Samples

Aluminum Windows; GA

Manufacturer's standard color samples of the specified finishes.

1.4 QUALIFICATION

Manufacturer shall have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

1.5 DELIVERY AND STORAGE

Aluminum windows shall be delivered to project site and stored in accordance with manufacturer's recommendations. Damaged windows shall be replaced with new windows.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties shall be provided.

PART 2 PRODUCTS

2.1 ALUMINUM WINDOW TYPES

Aluminum windows shall consist of complete units including sash, glass, frame, weatherstripping, and hardware. Windows shall conform to AAMA 101. Windows shall be double-glazed. Thermal barrier shall be neoprene, rigid vinyl, or polyurethane and shall be resistant to weather. Window members shall be heli-arc welded or angle-reinforced and mechanically joined and sealed. Exposed welded joints shall be dressed and finished. Joints shall be permanent and weathertight. Frames shall be constructed to provide a minimum 1/4 inch thermal break between the exterior and interior frame surfaces. Sash corners shall be internally sealed to prevent air and water leaks. Inner sash shall be key-controlled to swing to the interior to allow maintenance and replacement of the glass. Operable windows shall permit cleaning the outside glass from inside the building.

2.1.1 Fixed Half-Round Windows

Aluminum fixed (F) windows shall conform to AAMA 101 F-HC40 type,

non-operable glazed frame, complete with provisions for reglazing in the field.

## 2.2 ACCESSORIES

### 2.2.1 Fasteners

Fastening devices shall be window manufacturer's standard design made from aluminum, in compliance with AAMA 101. Self-tapping sheet metal screws will not be acceptable for material thicker than 1/16 inch.

### 2.2.2 Window Anchors

Anchoring devices for installing windows shall be made of aluminum, cadmium-plated steel, stainless steel, or zinc-plated steel conforming to AAMA 101.

## 2.3 GLASS AND GLAZING

Aluminum windows shall be designed for inside glazing, field glazing, and for glass types scheduled on drawings and specified in Section 08810 GLASS AND GLAZING. Units shall be complete with glass and glazing provisions to meet AAMA 101. Glazing material shall be compatible with aluminum, and shall not require painting.

## 2.4 FINISH

### 2.4.1 Anodized Aluminum Finish

Exposed surfaces of aluminum windows shall be finished with anodic coating conforming to AA DAF-45: Architectural Class I, AA-M10-C22-A44, color anodic coating, 0.7 mil or thicker. Finish shall be free of scratches and other blemishes.

### 2.4.2 Color

Color shall be Roman Bronze.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Aluminum windows shall be installed in accordance with approved shop drawings and manufacturer's published instructions. Aluminum surfaces in contact with masonry, concrete, wood and dissimilar metals other than stainless steel, zinc, cadmium or small areas of white bronze, shall be protected from direct contact using protective materials recommended by AAMA 101. The completed window installation shall be watertight in accordance with Section 07900 JOINT SEALING. Glass and glazing shall be installed in accordance with requirements of this section and Section 08810 GLASS AND GLAZING.

### 3.2 ADJUSTMENTS AND CLEANING

#### 3.2.1 Hardware Adjustments

Final operating adjustments shall be made after glazing work is complete. Operating sash or ventilators shall operate smoothly and shall be weathertight when in locked position.

3.2.2 Cleaning

Aluminum window finish and glass shall be cleaned on exterior and interior sides in accordance with window manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions shall be taken to avoid scratching or marring window finish and glass surfaces.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 08 - DOORS & WINDOWS

SECTION 08625

TUBULAR SKYLIGHTS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 PERFORMANCE REQUIREMENTS

PART 2 PRODUCTS

- 2.1 TUBULAR SKYLIGHTS
  - 2.1.1 Roof Dome
  - 2.1.2 Ceiling Diffuser
  - 2.1.3 Roof Flashing
  - 2.1.4 Main Tube and Reflector
  - 2.1.5 Accessories
  - 2.1.6 Fabrication

PART 3 EXECUTION

- 3.1 INSTALLATION

-- End of Section Table of Contents --

SECTION 08625

TUBULAR SKYLIGHTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|            |  |
|------------|--|
| ASTM B 209 | (1996) Aluminum and Aluminum-Alloy Sheet and Plate   |
| ASTM E 283 | (1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen |
| ASTM E 330 | (1997e1) Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference                                |
| ASTM E 331 | (1996) Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference                                       |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Tubular Skylights; GA

Submit shop drawings showing construction, dimensions, and details of all components.

SD-09 Reports

Tubular Skylights; GA

Submit certified, independent laboratory test report showing compliance with the performance requirements specified below.

1.3 PERFORMANCE REQUIREMENTS

Skylights shall meet the following requirements:

- a. Air Infiltration: Maximum 0.10 cfm per ft of crack length at 6.24 psf pressure differential when tested in accordance with ASTM E 283.
- b. Water Resistance: No uncontrolled water leakage at 6.00 psf pressure differential with water rate of 5 gallon/hour/square feet when tested in accordance with ASTM E 331.
- c. Uniform Load Deflection: No breakage, permanent damage to fasteners, hardware parts, or damage to make tubular skylight inoperable at both a positive and a negative load. All tests shall be in accordance with ASTM E 330.
- d. Uniform Load Structural: Unit to be tested at 3 X positive wind and 2 X negative wind pressure design wind pressure, acting normal to plane of roof in accordance with ASTM E 330. No breakage, permanent damage to fasteners, hardware parts, or damage to make tubular skylight inoperable or permanent deflection of any section in excess of 0.2 percent of its span.

## PART 2 PRODUCTS

### 2.1 TUBULAR SKYLIGHTS

#### 2.1.1 Roof Dome

Injection molded polycarbonate classified as CC1 material. Thickness shall be not less than 0.125 inch. Visible light transmission shall be 92 percent or greater. Roof dome shall contain a series of concentric, light refracting etched lines a minimum of 2 inches high to improve light input when sun is low on horizon.

#### 2.1.2 Ceiling Diffuser

Injection molded, acrylic plastic classified as CC2 Plexiglas. Thickness shall be not less than 0.087 inch. Provide prismatic design to maximize light output.

#### 2.1.3 Roof Flashing

Aluminized steel manufactured in a single piece without seams, joints or welds and pitched for roof slope.

#### 2.1.4 Main Tube and Reflector

Fabricate from aluminum sheet meeting the requirements of ASTM B 209, alloy and temper as required by manufacturer to suit forming operations and finish requirements, 0.020 inch thick. Provide exposed aluminum surface with high polished specular finish meeting AAMA designation M21C31A31. Specular reflectance to be 92 percent and total reflectance to be 95 percent.

#### 2.1.5 Accessories

- a. Dress Ring: 30 percent talc filled polypropylene or high impact ABS.
- b. Sealant: Polyurethane or copolymer - based elastomeric sealant as recommended by skylight manufacturer.

- c. Weather Seal: Medium density pile weatherstripping and light density polyvinyl chloride foam tape or UV resistant EPDM rubber.
- d. Ceiling Diffuser Seal: Closed cell polyethylene foam, 3 pounds per cubic foot, and white polyvinyl chloride seal butt joint welded or EPDM rubber.
- e. Fasteners: Same as metals being fastened or non-magnetic stainless steel or other non-corrosive metal as recommended by skylight manufacturer.

#### 2.1.6 Fabrication

Finish, fabricate, and shop prepare all assemblies under responsibility of one manufacturer. Fabricate to allow for thermal movement of materials when subject to a temperature differential from -30 degrees F to +180 degrees F. Provision shall be made to insure that water will not accumulate and remain in contact within system components.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Install skylights in accordance with shop drawings and manufacturer's recommendations.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 08 - DOORS & WINDOWS

SECTION 08700

BUILDERS' HARDWARE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, STORAGE, AND HANDLING
- 1.4 SPECIAL TOOLS
- 1.5 WARRANTY
- 1.6 OPERATION AND MAINTENANCE MANUALS

PART 2 PRODUCTS

- 2.1 GENERAL HARDWARE REQUIREMENTS
- 2.2 TEMPLATES
- 2.3 HINGES
  - 2.3.1 Hinges for Reverse Bevel Doors with Locks
  - 2.3.2 Contractor's Option
- 2.4 EXIT DEVICES AND EXIT DEVICE ACCESSORIES
  - 2.4.1 Exit Devices and Auxiliary Items
  - 2.4.2 Auxiliary Locks and Associated Products
  - 2.4.3 Lock Cylinders (Mortise, Rim and Bored)
  - 2.4.4 Lock Trim
- 2.5 KEYING
- 2.6 DOOR CLOSING DEVICES
  - 2.6.1 Surface Type Closers
- 2.7 ARCHITECTURAL DOOR TRIM
  - 2.7.1 Door Protection Plates
    - 2.7.1.1 Kick Plates
- 2.8 MISCELLANEOUS
  - 2.8.1 Metal Thresholds
  - 2.8.2 Rain Drips
  - 2.8.3 Aluminum Housed Type Weatherseals
- 2.9 FASTENINGS
- 2.10 FINISHES

PART 3 EXECUTION

- 3.1 APPLICATION
  - 3.1.1 Door-Closing Devices
  - 3.1.2 Kick Plates and Mop Plates
  - 3.1.3 Thresholds
  - 3.1.4 Rain Drips
  - 3.1.5 Weatherseals
- 3.2 HARDWARE SETS

-- End of Section Table of Contents --

SECTION 08700

BUILDERS' HARDWARE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|            |  |
|------------|--|
| ASTM E 283 | (1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen |
|------------|--|

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

|              |  |
|--------------|--|
| BHMA A156.1  | (1997) Butts and Hinges                      |
| BHMA A156.3  | (1994) Exit Devices                          |
| BHMA A156.4  | (1992) Door Controls - Closers               |
| BHMA A156.5  | (1992) Auxiliary Locks & Associated Products |
| BHMA A156.7  | (1997) Template Hinge Dimensions             |
| BHMA A156.18 | (1993) Materials and Finishes                |
| BHMA A156.21 | (1996) Thresholds                            |

DOOR AND HARDWARE INSTITUTE (DHI)

|                       |   |
|-----------------------|---|
| DHI Keying Systems    | (1989) Keying Systems and Nomenclature  |
| DHI Locations for CSD | (1997) Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames       |
| DHI Locations for SSD | (1990) Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames |
| DHI ANSI/DHI A115.1G  | (1994) Installation Guide for Doors and Hardware  |
| DHI ANSI/DHI A115-W   | (Varies) Wood Door Hardware Standards<br>(Incl A115-W1 thru A115-W9)                        |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Hardware Schedule; GA

Hardware schedule listing all items to be furnished. The schedule shall include for each item: the quantities; manufacturer's name and catalog numbers; the ANSI number specified, sizes; detail information or catalog cuts; finishes; door and frame size and materials; location and hardware set identification cross-references to drawings; corresponding reference standard type number or function number from manufacturer's catalog if not covered by ANSI or BHMA; and list of abbreviations and template numbers.

Keying; GA

Keying schedule developed in accordance with DHI Keying Systems, after the keying meeting with the user.

1.3 DELIVERY, STORAGE, AND HANDLING

Hardware shall be delivered to the project site in the manufacturer's original packages. Each article of hardware shall be individually packaged in the manufacturer's standard commercial carton or container, and shall be properly marked or labeled to be readily identifiable with the approved hardware schedule. Each change key shall be tagged or otherwise identified with the door for which its cylinder is intended. Manufacturer's printed installation instructions, fasteners, and special tools shall be included in each package.

1.4 SPECIAL TOOLS

Special tools, such as those supplied by the manufacturer, unique wrenches, and dogging keys, shall be provided as required to adjust hardware items.

1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties shall be provided.

1.6 OPERATION AND MAINTENANCE MANUALS

Six complete copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides shall be provided.

PART 2 PRODUCTS

2.1 GENERAL HARDWARE REQUIREMENTS

Hardware shall conform to the requirements specified herein and the HARDWARE SETS listing at the end of this section. The following hardware shall be provided matching Owner's existing. No substitutes allowed.

- a. Locks: Russwinn ML2265 with LWA handle stainless steel.
- b. Cylinders: MEDCO.
- c. HingesL Stanley FBB199 - stainless steel.

Hardware set numbers correspond to the set numbers shown on the drawings.

## 2.2 TEMPLATES

Requirements for hardware to be mounted on metal doors or metal frames shall be coordinated between hardware manufacturer and door or frame manufacturer by use of templates and other information to establish location, reinforcement required, size of holes, and similar details. Templates of hinges shall conform to BHMA A156.7.

## 2.3 HINGES

Hinges shall conform to BHMA A156.1. Hinges used on metal doors and frames shall also conform to BHMA A156.7. Except as otherwise specified, hinge sizes shall conform to the hinge manufacturer's printed recommendations.

### 2.3.1 Hinges for Reverse Bevel Doors with Locks

Hinges for reverse bevel doors with locks shall have pins that are made nonremovable by means such as a set screw in the barrel, or safety stud, when the door is in the closed position.

### 2.3.2 Contractor's Option

Hinges with antifriction bearings may be furnished in lieu of ball bearing hinges.

## 2.4 EXIT DEVICES AND EXIT DEVICE ACCESSORIES

Exit devices and exit device accessories shall conform to BHMA A156.3, Grade 1. To the maximum extent possible, exit devices and all components thereof, including cylinders, shall be the products of a single manufacturer.

### 2.4.1 Exit Devices and Auxiliary Items

Touch bars shall be provided in lieu of conventional crossbars and arms.

### 2.4.2 Auxiliary Locks and Associated Products

Bored and mortise dead locks and dead latches, narrow style dead locks and dead latches, rim latches, dead latches, and dead bolts, shall conform to BHMA A156.5. Bolt and latch retraction shall be dead bolt style. Strike boxes shall be furnished with dead bolt and latch strikes for Grade 1.

### 2.4.3 Lock Cylinders (Mortise, Rim and Bored)

Lock cylinders shall comply with BHMA A156.5. Lock cylinder shall have not less than six pins. A master keying system shall be provided.

### 2.4.4 Lock Trim

Lock trim shall be heavy wrought construction of commercial plain design.

Lever handles and escutcheons shall be 0.050 inch thick, if unreinforced. If reinforced, the outer shell shall be 0.035 inch thick and the combined thickness shall be 0.070 inch except that knob shanks shall be 0.060 inch thick. Lever handles shall be of plain design with ends returned to no more than 1/2 inch from the door face. Adjustable strikes shall be provided for rim type devices. Escutcheons shall be provided not less than 7 by 2-1/4 inches. Escutcheons shall be cut to suit cylinders and operating trim.

## 2.5 KEYING

Locks shall be keyed in sets or subsets as scheduled. Change keys for locks shall be stamped with change number and the inscription "U.S. Property - Do Not Duplicate." Keys shall be supplied as follows:

|                    |                          |
|--------------------|--------------------------|
| Locks:             | 3 change keys each lock. |
| Master keyed sets: | 3 keys each set.         |

The keys shall be furnished to the Contracting Officer arranged in sets or subsets as scheduled. Review the keying system with the Contracting Officer and provide the type required (master, grandmaster or great-grandmaster). Comply with Contracting Officer's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

## 2.6 DOOR CLOSING DEVICES

Door closing devices shall conform to BHMA A156.4, Grade 1. Closing devices shall be products of one manufacturer for each type specified. The opening resistance of closing devices shall not exceed 15 lbf applied at the latch stile or exceed 5 lbf.

### 2.6.1 Surface Type Closers

Surface type closers shall be Grade 1, Series C02000 Standard Cover with options PT-4C, Size 1 or 2 through Size 6. Except as otherwise specified, sizes shall conform to the manufacturer's published recommendations. Closers for outswinging exterior doors shall have parallel arms or shall be top jamb mounted.

## 2.7 ARCHITECTURAL DOOR TRIM

### 2.7.1 Door Protection Plates

#### 2.7.1.1 Kick Plates

Kick plates shall be Type J102 stainless steel. Width of plates shall be 2 inches less than door width for single doors and 1 inch less for pairs of doors. Height shall be 16 inches. Edges of metal plates shall be beveled.

## 2.8 MISCELLANEOUS

### 2.8.1 Metal Thresholds

Thresholds shall conform to BHMA A156.21. Thresholds for exterior doors shall be extruded aluminum of the type indicated and shall provide proper clearance and an effective seal with specified weather stripping. Thresholds shall be beveled with slopes not exceeding 1:2 and with heights

not exceeding 1/2 inch.

#### 2.8.2 Rain Drips

Extruded aluminum, not less than 0.07 inch thick, clear anodized. Door sill rain drips shall be 1-1/2 inches to 1-3/4 inches high by 5/8 inch projection. Overhead rain drips shall be approximately 1-1/2 inches high by 2-1/2 inches projection and shall extend 2 inches on either side of the door opening width.

#### 2.8.3 Aluminum Housed Type Weatherseals

Weatherseals of the type indicated shall consist of extruded aluminum retainers not less than 0.07 inch wall thickness with vinyl, neoprene, silicone rubber, polyurethane or vinyl brush inserts. Aluminum shall be clear (natural) anodized. Weatherseal material shall be of an industrial/commercial grade. Seals shall remain functional through all weather and temperature conditions. Air leakage rate of weatherstripping shall not exceed 0.5 cubic feet per minute per lineal foot of crack when tested in accordance with ASTM E 283 at standard test conditions.

#### 2.9 FASTENINGS

Fastenings of proper type, size, quantity, and finish shall be supplied with each article of hardware. Machine screws and expansion shields shall be used for attaching hardware to concrete or masonry. Fastenings exposed to the weather in the finished work shall be of brass, bronze, or stainless steel.

#### 2.10 FINISHES

Unless otherwise specified, finishes shall conform to those identified in BHMA A156.18. Where painting of primed surfaces is required, painting is specified in Section 09900 PAINTING, GENERAL.

### PART 3 EXECUTION

#### 3.1 APPLICATION

Hardware shall be located in accordance with DHI Locations for CSD and DHI Locations for SSD, except that deadlocks shall be mounted 48 inches above finish floor. When approved, slight variations in locations or dimensions will be permitted. Application shall be in accordance with DHI ANSI/DHI A115.1G or DHI ANSI/DHI A115-W. Door control devices for exterior doors such as closers and holders, shall be attached to doors with thru bolts and nuts or sex bolts. Alternate fastening methods may be approved by the Contracting Officer when manufacturers' documentation is submitted to verify that the fastening devices and door reinforcements are adequate to resist wind induced stresses.

##### 3.1.1 Door-Closing Devices

Door-closing devices shall be installed and adjusted in accordance with the templates and printed instructions supplied by the manufacturer of the devices. Doors opening to the exterior shall have the closer mounted on the interior side of the door.

##### 3.1.2 Kick Plates and Mop Plates

Kick plates shall be installed on the push side of doors.

### 3.1.3 Thresholds

Thresholds shall be secured with a minimum of three fasteners per single door width and six fasteners per double door width with a maximum spacing of 12 inches. Exterior thresholds shall be installed in a bed of sealant with expansion anchors and stainless steel screws, except that bronze or anodized bronze thresholds shall be installed with expansion anchors with brass screws. Minimum screw size shall be No. 10 length, dependent on job conditions, with a minimum of 3/4 inch thread engagement into the floor or anchoring device used.

### 3.1.4 Rain Drips

Door sill rain drips shall align with the bottom edge of the door. Overhead rain drips shall align with bottom edge of door frame rabbet. Drips shall be set in sealant and fastened with stainless steel screws.

### 3.1.5 Weatherseals

Weatherseals shall be located as indicated, snug to door face and fastened in place with color matched metal screws after door and frames have been finish painted. Screw spacing shall be as recommended by manufacturer.

## 3.2 HARDWARE SETS

### HW-1 Pump Station Doors

|           |  |
|-----------|--|
| 1-1/2 pr. | Hinges, A2111, 626, hinge height: 4-1/2 inches |
| 1 ea.     | Exit Device, Type 1, Function 08-Grade 1, 626  |
| 1 ea.     | Closer, C02021, 628                            |
| 1 ea.     | Kick Plate, J102, 630                          |
| 1 set     | Weatherseals, 628                              |
| 1 ea.     | Rain drip, 628                                 |
| 1 ea.     | Threshold, J603 J32130                         |

### HW-2 Mechanical Room Doors

|           |   |
|-----------|---|
| 1-1/2 pr. | Hinges, A2111, 626, hinge height: 4-1/2 inches    |
| 1 ea.     | Mortise Lockset, Type 1, Function 04-Grade 1, 626 |
| 1 ea.     | Closer, C02021, 628                               |
| 1 ea.     | Raindrip, 628                                     |
| 1 ea.     | Threshold, J603 J32130                            |

### HW-3 Restroom Toilet and Changing Room Doors

|           |   |
|-----------|---|
| 1-1/2 pr. | Hinges, A2111, 626, hinge height: 4-1/2 inches      |
| 1 ea.     | Deadlock, Type 1, Function E06072, Grade 1, 626     |
| 1 ea.     | Pushplate, J301, 8 inch x 16 inches x 16 gauge, 626 |
| 1 ea.     | Pullplate, J405, 8 inch x 16 inches x 16 gauge, 626 |
| 1 ea.     | Closer, C02021, 628                                 |
| 1 ea.     | Kick Plate, J102, 630                               |
| 1 set     | Weatherseals, 628                                   |
| 1 ea.     | Rain drip, 628                                      |
| 1 ea.     | Threshold, J603 J32130                              |

### HW-4 Vending Double Doors

|           |   |
|-----------|---|
| 1-1/2 pr. | Hinges, A2111, 626, hinge height: 4-1/2 inches    |
| 1 ea.     | Flush Bolts, L4081                                |
| 1 ea.     | Mortise Lockset, Type 1, Function 04-Grade 1, 626 |
| 2 ea.     | Cane bolts  |

Grand Forks Phase 2 Levees

|       |                        |
|-------|------------------------|
| 1 set | Weatherseals, 628      |
| 1 ea. | Rain drip, 628         |
| 1 ea. | Threshold, J603 J32130 |

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 08 - DOORS & WINDOWS

SECTION 08810

GLASS AND GLAZING

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 SYSTEM DESCRIPTION
- 1.4 DELIVERY, STORAGE AND HANDLING
- 1.5 PROJECT/SITE CONDITIONS
- 1.6 WARRANTY
  - 1.6.1 Insulating Glass

PART 2 PRODUCTS

- 2.1 GLASS
  - 2.1.1 Insulating Glass
  - 2.1.2 Tempered Glass
- 2.2 GLAZING ACCESSORIES
  - 2.2.1 Glazing Compound and Preformed Glazing Sealants
  - 2.2.2 Glazing Accessories

PART 3 EXECUTION

- 3.1 PREPARATION AND INSTALLATION
- 3.2 CLEANING
- 3.3 PROTECTION

-- End of Section Table of Contents --

SECTION 08810

GLASS AND GLAZING

PART 1 GENERAL

This section covers the furnishing and installation of glass and glazing throughout as required by the drawings and specifications, except for overhead rolling door windows specified in SECTION: OVERHEAD ROLLING DOORS.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

|            |   |
|------------|---|
| ANSI Z97.1 | (1984; R 1994) Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings |
|------------|---|

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |  |
|-------------|--|
| ASTM C 1036 | (1991; R 1997) Flat Glass  |
| ASTM C 1048 | (1997b) Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass                   |
| ASTM E 773  | (1997) Accelerated Weathering of Sealed Insulating Glass Units                                 |
| ASTM E 774  | (1997) Classification of the Durability of Sealed Insulating Glass Units                       |
| ASTM E 1300 | (1998) Determining the Minimum Thickness and Type of Glass Required to Resist a Specified Load |

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

|                       |                                     |
|-----------------------|-------------------------------------|
| GANA Glazing Manual   | (1997) Glazing Manual               |
| GANA Standards Manual | (1995) Engineering Standards Manual |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Insulating Glass; GA. Glazing Accessories; GA.

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

#### SD-04 Drawings

Installation; GA.

Drawings showing complete details of the proposed setting methods, mullion details, edge blocking, size of openings, frame details, materials, and types and thickness of glass.

#### SD-13 Certificates

Insulating Glass; GA.

Certificates stating that the glass meets the specified requirements. Labels or manufacturers marking affixed to the glass will be accepted in lieu of certificates.

#### SD-14 Samples

Insulating Glass; GA.

Two 8 x 10 inch samples of each of the following: tinted glass, patterned glass, heat-absorbing glass, and insulating glass units.

### 1.3 SYSTEM DESCRIPTION

Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, and defects in the work. Glazed panels shall comply with the safety standards, as indicated in accordance with ANSI Z97.1. Glazed panels shall comply with indicated wind/snow loading in accordance with ASTM E 1300.

### 1.4 DELIVERY, STORAGE AND HANDLING

Glazing compounds shall be delivered to the site in the manufacturer's unopened containers. Glass shall be stored indoors in a safe, well ventilated dry location in accordance with manufacturer's instructions, and shall not be unpacked until needed for installation. Glass shall not be stored on site over 1 month.

### 1.5 PROJECT/SITE CONDITIONS

Glazing work shall not be started until outdoor temperature is above 40 degrees F and rising, unless procedures recommended by glass manufacturer and approved by Contracting Officer are made to warm the glass and rabbet surfaces. Ventilation shall be provided to prevent condensation of moisture on glazing work during installation. Glazing work shall not be performed during damp or raining weather.

### 1.6 WARRANTY

#### 1.6.1 Insulating Glass

Manufacturer shall warrant the insulating glass to be free of fogging or

film formation on the internal glass surfaces caused by failure of the hermetic seal for a period of 10 years from Date of Substantial Completion. Warranty shall be signed by manufacturer.

## PART 2 PRODUCTS

### 2.1 GLASS

Glass shall conform to the requirements of ASTM C 1036, unless specified otherwise.

#### 2.1.1 Insulating Glass

Shall be formed of two pieces of Type I, Class I, Quality q3, 1/4-inch thick glass, separated by a 1/8-inch dehydrated air space, hermetically sealed. Exterior light of insulating units shall be tempered glass with a VE2-85 low emissivity coating and a base glass color of green as manufactured by Viracon or approved equal. Insulating glass units shall have polyisobutylene primary seal with two part silicone secondary seals. Aluminum spacer frame shall be desiccant filled with a mill finish and have bent or soldered corners. Insulating glass units shall conform to ASTM E 773 and ASTM E 774. Low emissivity coating shall be applied to second surface of insulating glass units. The insulating glass units shall have a maximum winter, nighttime U-value of 0.30, with a maximum shading coefficient of .43 and a maximum relative heat gain of 91".

#### 2.1.2 Tempered Glass

Tempered glass shall be Kind FT (fully tempered transparent), Type 1 (flat), Class 1-clear, Condition A uncoated surface, conforming to ASTM C 1048 and GANA Standards Manual. Color shall be clear.

### 2.2 GLAZING ACCESSORIES

#### 2.2.1 Glazing Compound and Preformed Glazing Sealants

Suitable type approved for the application and in accordance with applicable portions of the FGMA Glazing Manual. Materials used with aluminum frames shall be colored, as selected, nonstaining, and not require painting. Other materials which will be exposed to view and unpainted shall be selected color from manufacturer's standard colors.

#### 2.2.2 Glazing Accessories

As required to supplement the accessories provided with the items to be glazed and to provide a complete installation, including glazing points, clips, shims, angles, beads, setting blocks, and spacer strips. Ferrous metal accessories which will be exposed in the finished work shall be a finish that will not corrode or stain while in service.

## PART 3 EXECUTION

### 3.1 PREPARATION AND INSTALLATION

Openings and framing systems scheduled to receive glass shall be examined for compliance with GANA Glazing Manual and glass manufacturer's approved installation instructions. Glazing surfaces shall be dry and free of frost.

3.2 CLEANING

Upon completion of project, outside surfaces of glass shall be washed clean and the inside surfaces of glass shall be washed and polished in accordance with glass manufacturer's recommendations.

3.3 PROTECTION

Glass work shall be protected immediately after installation. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 09 - FINISHES

SECTION 09260

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

- 2.1 GYPSUM BOARD - INTERIOR
  - 2.1.1 Exposed Board Surface
  - 2.1.2 Gypsum Backing Board for Carsiding
- 2.2 GYPSUM BOARD FASTENERS
- 2.3 GYPSUM BOARD METAL TRIM ACCESSORIES
- 2.4 JOINT TREATMENT MATERIALS
  - 2.4.1 Joint Tape
  - 2.4.2 Joint Compound

PART 3 EXECUTION

- 3.1 INSTALLATION OF GYPSUM BOARD
- 3.2 SINGLE LAYER GYPSUM BOARD APPLICATIONS
  - 3.2.1 Partition/Walls
  - 3.2.2 Ceilings
  - 3.2.3 Supports
- 3.3 CONTROL JOINTS
- 3.4 GYPSUM BOARD FINISHING
- 3.5 PROTECTION

-- End of Section Table of Contents --

SECTION 09260

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |  |
|-------------------|--|
| ASTM C 36         | (1997) Gypsum Wallboard  |
| ASTM C 475        | (1994) Joint Compound and Joint Tape for Finishing Gypsum Board                      |
| ASTM C 630/C 630M | (1996a) Water-Resistant Gypsum Backing Board   |
| ASTM C 840        | (1998) Application and Finishing of Gypsum Board                                     |
| ASTM C 1002       | (1998) Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases |
| ASTM C 1047       | (1998) Accessories for Gypsum Wallboard and Gypsum Veneer Base                       |

1.2 DELIVERY, STORAGE, AND HANDLING

Schedule delivery to minimize storage periods at project site. Deliver materials in accordance with manufacturer's instructions; ship unopened containers or packages, fully identified with manufacturer's name, brand, type and grade. Store boards flat with uniform support. Protect from weather and damage as recommended by manufacturer.

PART 2 PRODUCTS

2.1 GYPSUM BOARD - INTERIOR

2.1.1 Exposed Board Surface

Exposed board surface shall be 5/8" thick gypsum wallboard unless otherwise indicated, complying with ASTM C 36, with paper face surface suitable to receive decorated finish and long edges tapered to receive standard joint treatment, in lengths as required for minimum number of joints.

2.1.2 Gypsum Backing Board for Carsiding

Water-resistant gypsum backing board, ASTM C 630/C 630M, with core and paper facings treated to resist moisture.

## 2.2 GYPSUM BOARD FASTENERS

Provide type and size recommended by manufacturer for applications shown. Review fire-rated assembly requirements for fastener spacing. In general, fasten gypsum board with self-drilling screws designed for gypsum board, ASTM C 1002. Screws shall be self-tapping when used with metal framing up to 12 gauge. Heads shall be designed for covering with finishing compound if exposed in face layers.

## 2.3 GYPSUM BOARD METAL TRIM ACCESSORIES

Provide trim accessories of sizes required for applications shown, fabricated of galvanized steel, complying with ASTM C 1047 as follows:

- a. External Corners: Metal corner bead with smooth rigid nose and perforated and knurled metal flanges.
- b. Control Joints: Where shown and as required in Part 3 Execution, one-piece joint assembly of non-corrosive metal or extruded vinyl with continuous unperforated V-slot for insertion into joint and perforated flanges for attachment to face of gypsum board with slot opening covered with removable strip.
- c. Where face panels abut dissimilar materials, at reveals, and where designated: Shaped metal trim designed to be concealed by taping operations.
- d. Exposed panel edges and where designated: J-shape casing beads designed to be concealed by taping.

## 2.4 JOINT TREATMENT MATERIALS

### 2.4.1 Joint Tape

Plain or perforated paper, ASTM C 475.

### 2.4.2 Joint Compound

Factory-prepackaged vinyl based products, ASTM C 475. Provide in dry powder form for mixing with water at jobsite or factory pre-mixed, for single or two-compound treatment. Taping compound shall be formulated for embedding tape and first coat over fasteners and flanges of corner beads and edge trim. Topping compounds shall be formulated for fill (second) and finish (third) coats. All purpose compounds shall be formulated for use as both taping and topping compounds.

## PART 3 EXECUTION

### 3.1 INSTALLATION OF GYPSUM BOARD

Comply with ASTM C 840, unless otherwise recommended by gypsum board manufacturer. Examine substrates and conditions; notify of detrimental conditions. Do not proceed until unsatisfactory conditions are corrected. Do not exceed 1/8 inch in 8 feet variation from plumb or level in line or surface; except at joints between units, do not exceed 1/16 inch variation between planes of abutting edges or ends. Shim as required to comply with



specified tolerances. Provide additional framing and blocking as required to support gypsum board at openings and cutouts, and to support built-in anchorage and attachment devices for other work. Form control joints in gypsum board construction where indicated below. Allow 1/2 inch continuous opening between edges of adjacent drywall boards to allow for insertion of control joint trim accessory.

### 3.2 SINGLE LAYER GYPSUM BOARD APPLICATIONS

#### 3.2.1 Partition/Walls

For heights of 8 feet-1 inch or less, apply gypsum board vertically or horizontally at contractor's option. For heights greater than 8 feet-1 inch or for areas less than 4 feet wide, apply vertically. Use floor-to-ceiling length boards for vertical applications and locate edge joints over supports, but offset at least one stud on opposite faces of partition/walls. Use maximum practical length boards for horizontal applications and locate end joints over supports and stagger in alternate courses of board.

#### 3.2.2 Ceilings

Apply gypsum board with long dimension at right angles to supports with end butt joints located over supports. Use maximum practical length boards to minimize end butt joints. Stagger end joints in alternate courses of boards and locate as far away from center of ceiling as possible.

#### 3.2.3 Supports

Fasten gypsum board with screws. Comply with manufacturer's instructions for fastening, but do not exceed 12 inch o.c. spacing.

### 3.3 CONTROL JOINTS

Gypsum panel surfaces shall be isolated with control joints where:

- a. Partition, furring, or column fireproofing abuts a structural element (excepts floor) or dissimilar wall or ceiling.
- b. Ceiling abuts a structural element, dissimilar wall or partition, or other vertical penetration.
- c. Construction changes within plane of partition or ceiling.
- d. Partition or furring run exceeds 30 feet.
- e. Wings of "L", "U" and "T"-shaped ceiling areas are joined.

### 3.4 GYPSUM BOARD FINISHING

Do not install joint treatment compounds unless conditions comply with minimum temperature and ventilation requirements recommended by manufacturer. Finish exposed gypsum board surfaces with joints, corners, and exposed edges reinforced or trimmed as specified, and with joints, fasteners, accessory flanges, and surface defects filled with joint compound in accordance with manufacturer's recommendations for a smooth, flush surface. Gypsum board finishing work will not be considered acceptable if corners or edges do not form true, level, or plumb lines, or if joints, fastener heads, flanges of accessories, or defects are visible

after application.

### 3.5 PROTECTION

Comply with proper procedures for protection of completed gypsum board work from damage or deterioration until acceptance of work.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 09 - FINISHES

SECTION 09310

CERAMIC TILE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 QUALITY ASSURANCE
- 1.4 DELIVERY AND STORAGE
- 1.5 EXTRA MATERIALS

PART 2 PRODUCTS

- 2.1 GLAZED WALL TILE
- 2.2 QUARRY TILE
- 2.3 SETTING MATERIALS
- 2.4 GROUTING MATERIALS
- 2.5 SEALANTS
- 2.6 PROTECTIVE MATERIALS

PART 3 EXECUTION

- 3.1 EXAMINATION OF SURFACES
- 3.2 LAYOUT
- 3.3 TILE INSTALLATION, GENERAL
- 3.4 SETTING METHODS
- 3.5 GROUTING
- 3.6 CLEANING
- 3.7 PROTECTION

-- End of Section Table of Contents --

SECTION 09310

CERAMIC TILE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A118.1 (1992) Dry-Set Portland Cement Mortar

ANSI A137.1 (1988) Ceramic Tile

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Tile; GA

Submit product data and installation instructions. Include certifications and other data to show compliance with these specifications.

SD-14 Samples

Tile; GA

Submit samples of each type, class, and color of tile and trim. Samples will be reviewed for color, pattern and texture only; compliance with all other requirements is Contractor's responsibility.

1.3 QUALITY ASSURANCE

Provide tile certified by Tile Council of America (TCA) to equal or exceed ANSI A137.1, "Standard Grade". Comply with TCA specifications for installation of ceramic tile. Provide materials obtained from one source for each type and color of tile.

1.4 DELIVERY AND STORAGE

Deliver materials and store on site in original containers with seals and labels intact until used.

## Grand Forks Phase 2 Levees

### 1.5 EXTRA MATERIALS

Supply an extra 2 percent of total quantity of each tile and trim. Place in clean marked cartons for Government's use.

## PART 2 PRODUCTS

### 2.1 GLAZED WALL TILE

Where ceramic base is indicated in rooms with concrete floor, provide 4-1/2 inches high x 4-1/2 inches long glazed tile specifically designed for this application, with cove base and rounded top.

### 2.2 QUARRY TILE

Unglazed Quarry tile: ANSI A137.1, standard grade, square edges, with plain face.

Nominal Facial Dimensions  
in inches:

Nominal Thickness  
in inches:

6 by 6

1/2

### 2.3 SETTING MATERIALS

Dry set mortar shall comply with ANSI A118.1, gray or white as required.

### 2.4 GROUTING MATERIALS

Glazed tile shall be commercial, white portland cement grout, wet or dry formation as appropriate.

### 2.5 SEALANTS

See Section 07900 JOINT SEALING.

### 2.6 PROTECTIVE MATERIALS

Neutral cleaner; heavy duty nonstaining construction paper with compatible masking tape.

## PART 3 EXECUTION

### 3.1 EXAMINATION OF SURFACES

Inspect substrates for condition and maximum variations shown below:

|                |                    |
|----------------|--------------------|
|                | <u>Wall</u>        |
| Dry-Set Mortar | 1/8 inch in 8 feet |

Report unacceptable surfaces. Surfaces to be tiled shall be free from coatings, curing membranes, oil, grease, wax, and dust. Do not proceed until unsatisfactory conditions are corrected.

### 3.2 LAYOUT

Determine location of movement joints. Lay out tile work to minimize cuts less than one-half tile in size. Locate cuts to be least conspicuous. Align wall joints to give straight uniform grout lines, plumb and level. Make joints between tile sheets same width as joints within sheets so

extent of each sheet is not apparent in finished work.

### 3.3 TILE INSTALLATION, GENERAL

Use products in strict accordance with manufacturer recommendations. Proportion mixes in accordance with applicable ANSI 108-series standards. Terminate work neatly at obstructions, edges, and corners without disruption of pattern or joint alignments. Smooth exposed cut edges; clean cut edges before installing tiles. Fit tile carefully against trim and around pipes, electric boxes, and other built-in fixtures so that escutcheons, plates, and collars will completely overlap cut edges.

### 3.4 SETTING METHODS

Provide setting beds as shown or, when not indicated, use applicable TCA installation specifications for setting and grouting materials specified.

### 3.5 GROUTING

Grout in accordance with manufacturer's recommendations.

### 3.6 CLEANING

Clean tile surfaces thoroughly after grouting. Remove grout film, observing tile manufacturer's recommendations for chemical cleaners. Rinse tile work thoroughly with clean water before and after using chemical cleaners. Polish surface of tile work with soft cloth.

### 3.7 PROTECTION

Protect tile work with heavy duty construction paper or other material to prevent damage. Prohibit construction traffic from using newly tiled areas. Upon Substantial Completion, tile work shall be complete and free from defects. Repair damaged work to match adjacent surfaces.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 09 - FINISHES

SECTION 09900

PAINTING, GENERAL

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 PACKAGING, LABELING, AND STORING
- 1.4 APPROVAL OF MATERIALS
- 1.5 ENVIRONMENTAL CONDITIONS
- 1.6 SAFETY AND HEALTH
  - 1.6.1 Worker Exposures
  - 1.6.2 Toxic Compounds
  - 1.6.3 Training
  - 1.6.4 Coordination

PART 2 PRODUCTS

- 2.1 PAINT
  - 2.1.1 Colors and Tints
  - 2.1.2 Lead
  - 2.1.3 Chromium
  - 2.1.4 Volatile Organic Compound (VOC) Content

PART 3 EXECUTION

- 3.1 PROTECTION OF AREAS NOT TO BE PAINTED
- 3.2 SURFACE PREPARATION
  - 3.2.1 Masonry Surfaces
  - 3.2.2 Ferrous Surfaces
  - 3.2.3 Nonferrous Metallic Surfaces
  - 3.2.4 Gypsum Board Surfaces
  - 3.2.5 Wood Surfaces
    - 3.2.5.1 Interior Wood Stain
- 3.3 MIXING AND THINNING
- 3.4 APPLICATION
  - 3.4.1 Ventilation
  - 3.4.2 Respirators
  - 3.4.3 First Coat
  - 3.4.4 Timing
  - 3.4.5 Stains
- 3.5 SURFACES TO BE PAINTED
- 3.6 SURFACES NOT TO BE PAINTED
- 3.7 CLEANING
- 3.8 PAINTING SCHEDULES

-- End of Section Table of Contents --

SECTION 09900

PAINTING, GENERAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

|                    |   |
|--------------------|---|
| ACGIH Limit Values | (1999) Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices |
|--------------------|---|

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |  |
|-------------|--|
| ASTM D 4258 | (1999) Surface Cleaning Concrete for Coating |
|-------------|--|

COMMERCIAL ITEM DESCRIPTIONS (CID)

|              |  |
|--------------|--|
| CID A-A-1788 | (Canc. Notice 1)) Varnish, Oil; Interior                       |
| CID A-A-2246 | (Rev B) Paint, Latex   |
| CID A-A-2336 | (Rev A) Primer Coating (Alkyd, Exterior Wood, White and Tints) |
| CID A-A-2962 | (Rev A) Enamel, Alkyd (Metric)                                 |
| CID A-A-2994 | Primer Coating, Interior, for Walls and Wood                   |

FEDERAL SPECIFICATIONS (FS)

|                |  |
|----------------|--|
| FS TT-E-2784   | (Rev A) Enamel (Acrylic-Emulsion, Exterior Gloss and Semigloss) (Metric) |
| FS TT-S-708    | (Rev A; Am 2; Notice 1) Stain, Oil; Semi-Transparent, Wood, Exterior     |
| FS TT-S-001992 | (Basic; Notice 1) Stain, Latex, Exterior for Wood Surfaces               |

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

|               |   |
|---------------|---|
| SSPC Paint 5  | (1995) Zinc Dust, Zinc Oxide and Phenolic Varnish Paint                 |
| SSPC Paint 20 | (1991) Zinc-Rich Primers (Type I - "Inorganic" and Type II - "Organic") |



|                  |  |
|------------------|--|
| SSPC Paint 25    | (1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments) |
| SSPC SP 1        | (1982) Solvent Cleaning  |
| SSPC SP 2        | (1995) Hand Tool Cleaning  |
| SSPC SP 3        | (1995) Power Tool Cleaning   |
| SSPC SP 7/NACE 4 | (1994) Brush-Off Blast Cleaning  |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

Paint; FIO.

The names, quantity represented, and intended use for the proprietary brands of materials proposed to be substituted for the specified materials when the required quantity of a particular batch is 50 gallons or less.

Mixing and Thinning; FIO. Application; FIO.

Manufacturer's current printed product description, material safety data sheets (MSDS) and technical data sheets for each coating system. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times between coats for epoxy, moisture-curing polyurethane, and liquid glaze coatings. Detailed application instructions for textured coatings shall be provided.

### SD-09 Reports

Paint; FIO.

A statement as to the quantity represented and the intended use, plus the following test report for batches in excess of 50 gallons:

- a. A test report showing that the proposed batch to be used meets specified requirements:
- b. A test report showing that a previous batch of the same formulation as the batch to be used met specified requirements, plus, on the proposed batch to be used, a report of test results for properties of weight per gallon, viscosity, fineness of grind, drying time, color, and gloss.

### SD-13 Certificates

Lead; FIO. Volatile Organic Compound (VOC) Content; FIO.

Certificate stating that paints for interior use contain no mercurial mildewcide or insecticide. Certificate stating that paints proposed for use contain not more than 0.06 percent lead by weight of the total

nonvolatile. Certificate stating that paints proposed for use meet Federal VOC regulations and those of the of the local Air Pollution Control Districts having jurisdiction over the geographical area in which the project is located.

#### SD-14 Samples

Paint; FIO.

While the material is at the site or source of supply, and at a time agreeable to the Contractor and the Contracting Officer, a 1 quart sample of each color and batch, except for quantities of 50 gallons or less, shall be taken by random selection from the sealed containers by the Contractor in the presence of a representative of the Contracting Officer. The contents of the containers to be sampled shall be thoroughly mixed to ensure that the sample is representative. Samples shall be identified by designated name, specification number, manufacturer name and address, batch number, project contract number, intended use, and quantity involved.

### 1.3 PACKAGING, LABELING, AND STORING

Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons.

Paints and thinner shall be stored in accordance with the manufacturer's written directions and as a minimum stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 40 and 95 degrees F. Paints shall be stored on the project site or segregated at the source of supply sufficiently in advance of need to allow 30 days for testing.

### 1.4 APPROVAL OF MATERIALS

When samples are tested, approval of materials will be based on tests of the samples; otherwise, materials will be approved based on test reports furnished with them. If materials are approved based on test reports furnished, samples will be retained by the Government for testing should the materials appear defective during or after application. In addition to any other remedies under the contract the cost of retesting defective materials will be at the Contractor's expense.

### 1.5 ENVIRONMENTAL CONDITIONS

Unless otherwise recommended by the paint manufacturer, the ambient temperature shall be between 45 and 95 degrees F when applying coatings other than water-thinned, epoxy, and moisture-curing polyurethane coatings.

Water-thinned coatings shall be applied only when ambient temperature is between 50 and 90 degrees F. Epoxy, and moisture-curing polyurethane coatings shall be applied only within the minimum and maximum temperatures recommended by the coating manufacturer. Moisture-curing polyurethane shall not be applied when the relative humidity is below 30 percent.

### 1.6 SAFETY AND HEALTH

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in the CONTRACT CLAUSES. The Activity Hazard

Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

#### 1.6.1 Worker Exposures

Exposure of workers to hazardous chemical substances shall not exceed limits established by ACGIH Limit Values, or as required by a more stringent applicable regulation.

#### 1.6.2 Toxic Compounds

Toxic products having ineffective physiological warning properties, such as no or low odor or irritation levels, shall not be used unless approved by the Contracting Officer.

#### 1.6.3 Training

Workers having access to an affected work area shall be informed of the contents of the applicable material data safety sheets (MDSS) and shall be informed of potential health and safety hazard and protective controls associated with materials used on the project. An affected work area is one which may receive mists and odors from the painting operations. Workers involved in preparation, painting and clean-up shall be trained in the safe handling and application, and the exposure limit, for each material which the worker will use in the project. Personnel having a need to use respirators and masks shall be instructed in the use and maintenance of such equipment.

#### 1.6.4 Coordination

Work shall be coordinated to minimize exposure of building occupants, other Contractor personnel, and visitors to mists and odors from preparation, painting and clean-up operations.

### PART 2 PRODUCTS

#### 2.1 PAINT

The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat. Paint shall conform to the requirements listed in the painting schedules at the end of this section, except when the required amount of a material of a particular batch is 50 gallons or less, an approved first-line proprietary paint material with similar intended formulation, usage and color to that specified may be used. Additional requirements are as follows:

##### 2.1.1 Colors and Tints

Colors shall be as selected from manufacturer's standard colors, as indicated. Manufacturer's standard color is for identification of color only. Tinting of epoxy and urethane paints shall be done by the manufacturer. Stains shall conform in shade to manufacturer's standard color. The color of the undercoats shall vary slightly from the color of the next coat.

##### 2.1.2 Lead

Paints containing lead in excess of 0.06 percent by weight of the total nonvolatile content (calculated as lead metal) shall not be used.

#### 2.1.3 Chromium

Paints containing zinc chromate or strontium chromate pigments shall not be used.

#### 2.1.4 Volatile Organic Compound (VOC) Content

Paints shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards and shall conform to the restrictions of the local air pollution control authority.

### PART 3 EXECUTION

#### 3.1 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Surfaces contaminated by coating materials shall be restored to original condition.

#### 3.2 SURFACE PREPARATION

Surfaces to be painted shall be clean and free of foreign matter before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

##### 3.2.1 Masonry Surfaces

Masonry surfaces shall be allowed to dry at least 30 days before painting, except concrete slab on grade which shall be allowed to cure 90 days before painting. Surfaces shall be cleaned in accordance with ASTM D 4258. Glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of free iron and other foreign matter shall be removed prior to painting. Surfaces to receive polyurethane or epoxy coatings shall be acid-etched or mechanically abraded as specified by the coating manufacturer, rinsed with water, allowed to dry, and treated with the manufacturer's recommended conditioner prior to application of the first coat.

##### 3.2.2 Ferrous Surfaces

Ferrous surfaces including those that have been shop-coated, shall be solvent-cleaned or detergent-washed in accordance with SSPC SP 1. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with hand tools according to SSPC SP 2, power tools according to SSPC SP 3 or by sandblasting according to SSPC SP 7/NACE 4. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

### 3.2.3 Nonferrous Metallic Surfaces

Galvanized, aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces shall be solvent-cleaned or detergent-washed in accordance with SSPC SP 1.

### 3.2.4 Gypsum Board Surfaces

Gypsum board surfaces shall be dry and shall have all loose dirt and dust removed by brushing with a soft brush, rubbing with a cloth, or vacuum-cleaning prior to application of the first-coat material. A damp cloth or sponge may be used if paint will be water-based.

### 3.2.5 Wood Surfaces

Wood surfaces shall be cleaned of foreign matter. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter, unless otherwise authorized. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up before applying water-thinned paints. Small, dry seasoned knots shall be scraped, cleaned, and given a thin coat of commercial knot sealer, before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or, if it is still soft, removed with mineral spirits or turpentine, and the resinous area shall be thinly coated with knot sealer. Finishing nails shall be set, and all holes and surface imperfections shall be primed. After priming, holes and imperfections in finish surfaces shall be filled with putty or plastic wood filler, colored to match the finish coat if natural finish is required, allowed to dry, and sanded smooth. Putty or wood filler shall be compatible with subsequent coatings.

#### 3.2.5.1 Interior Wood Stain

Interior wood surfaces to receive stain shall be sanded. Oak and other open-grain wood to receive stain shall be given a coat of wood filler not less than 8 hours before the application of stain; excess filler shall be removed and the surface sanded smooth.

### 3.3 MIXING AND THINNING

When thinning is approved as necessary to suit surface, temperature, weather conditions, or application methods, paints may be thinned in accordance with the manufacturer's directions. When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

### 3.4 APPLICATION

Painting practices shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges,

waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

#### 3.4.1 Ventilation

Affected areas shall be ventilated during paint application so that workers exposure to chemical substances shall not exceed limits as established by ACGIH Limit Values, or as required by a more stringent applicable regulation. Interior work zones having a volume of 10,000 cubic feet or less shall be ventilated at a minimum of 2 air exchanges per hour. Ventilation in larger work zones shall be maintained by means of mechanical exhaust. Solvent vapors shall be exhausted outdoors, away from air intakes and workers. Return air inlets in the work zone shall be temporarily sealed before start of work until the coatings have dried.

#### 3.4.2 Respirators

Operators and personnel in the vicinity of operating paint sprayers shall wear respirators.

#### 3.4.3 First Coat

The first coat on gypsum wallboard, and other surfaces shall include repeated touching up of suction spots or overall application of primer or sealer to produce uniform color and gloss. Excess sealer shall be wiped off after each application. Each varnish coat shall be sanded lightly prior to application of subsequent coats.

#### 3.4.4 Timing

Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit weather conditions. Oil-based or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause the undercoat to lift or lose adhesion. Manufacturer's instructions for application, curing and drying time between coats of two-component systems shall be followed.

#### 3.4.5 Stains

Stain shall be applied at the rate specified in the manufacturer's printed directions. Oil-type stain shall be applied by brushing with the grain for the full length of the board or course of siding.

### 3.5 SURFACES TO BE PAINTED

Surfaces listed in the painting schedules at the end of this section, other than those listed in paragraph SURFACES NOT TO BE PAINTED, shall be painted

as scheduled.

### 3.6 SURFACES NOT TO BE PAINTED

Surfaces in the following areas shall not be painted:

- a. Concrete (except interior concrete walls).
- b. Metals fully embedded in concrete (except aluminum)
- c. Factory name plates.
- d. Galvanized steel items.
- e. Aluminum items, including guardrail.
- f. Burnished concrete masonry units.
- g. Brick.
- h. Stone.
- i. In addition, surfaces of hardware, fittings, and other factory finished items shall not be painted.

### 3.7 CLEANING

Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint and other deposits on adjacent surfaces shall be removed and the entire job left clean and acceptable.

### 3.8 PAINTING SCHEDULES

The following painting schedules identify the surfaces to be painted and prescribe the paint to be used and the number of coats of paint to be applied. Contractor options are indicated by -----or----- between optional systems or coats.

#### EXTERIOR PAINTING SCHEDULE

| <u>Surfac</u>                     | <u>First Coa</u>          | <u>Second Coa</u>         | <u>Third Coat</u> |
|-----------------------------------|---------------------------|---------------------------|-------------------|
| Wood, unless otherwise specified. | CID A-A-2336              | FS TT-E-2784              | FS TT-E-2784      |
| Wood: stain finish.               | FS TT-S-708               | None                      | None              |
|                                   | FS TT-S-001992<br>Class B | FS TT-S-001992<br>Class B | None              |

## EXTERIOR PAINTING SCHEDULE

| <u>Surfac</u>   | <u>First Coa</u>         | <u>Second Coa</u>                 | <u>Third Coat</u>                 |
|---|--------------------------|-----------------------------------|-----------------------------------|
| Ferrous metal<br>unless<br>otherwise specified  | SSPC Paint 5             | CID A-A-2962<br>Type I<br>Grade C | CID A-A-2962<br>Type 1<br>Grade C |
| Ferrous metal:<br>subject<br>to high<br>temperature, up<br>to 232 degrees C<br>(450 degrees F), | SSPC Paint 20<br>Type I  | None                              | None                              |
| Galvanized<br>metal.  | FS TT-E-2784<br>Type III | FS TT-E-2784                      | FS TT-E-2784                      |



## INTERIOR PAINTING SCHEDULE

| <u>Surfac</u>   | <u>First Coa</u>                | <u>Second Coa</u>                     | <u>Third Coat</u>                     |
|---|---------------------------------|---------------------------------------|---------------------------------------|
| Gypsum board,<br>concrete walls,<br>and concrete<br>masonry units | CID A-A-2994<br>Type II         | CID A-A-2246                          | CID A-A-2246                          |
| Ferrous Metal<br>unless<br>otherwise<br>specified                 | SSPC Paint 25                   | CID A-A-2962<br>Type I<br><br>Grade C | CID A-A-2962<br>Type I<br><br>Grade C |
| Galvanized metal:   | FS TT-E-2784<br>Type III        | FS TT-E-2784                          | None                                  |
| Wood: stain and<br>varnish finishes                               | Commercially<br>available stain | CID A-A-1788<br>Type clear<br>Class I | CID A-A-1788<br>Type clear<br>Class I |

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 09 - FINISHES

SECTION 09915

COLOR SCHEDULE

PART 1 GENERAL

- 1.1 GENERAL
- 1.2 SUBMITTALS

PART 2 PRODUCTS

- 2.1 REFERENCE TO MANUFACTURER'S COLOR
- 2.2 COLOR SCHEDULE
  - 2.2.1 Exterior Colors
    - 2.2.1.1 15th Avenue South Pump Station D3
    - 2.2.1.2 Belmont Coulee Pump Station E1
    - 2.2.1.3 8th Avenue North Pump Station C1
    - 2.2.1.4 Trail Directional Signage
    - 2.2.1.5 Community Green Ornamental Railing
    - 2.2.1.6 Floodwalls
  - 2.2.2 Interior Colors
    - 2.2.2.1 All Buildings

PART 3 EXECUTION (Not Applicable)

-- End of Section Table of Contents --

SECTION 09915

COLOR SCHEDULE

PART 1 GENERAL

1.1 GENERAL

This section covers only the color of the exterior and interior materials and products that are exposed to view in the finished construction. The word "color" as used herein includes surface color and pattern. Requirements for quality and method of installation are covered in other appropriate sections of the specifications. Specific locations where the various materials are required are shown on the drawings. Items not designated for color in this section may be specified in other sections. When color is not designated for items, the Contractor shall propose a color for approval.

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-14 Samples

Color Schedule; GA

Two sets of color boards, 60 days after the Contractor is given Notice to proceed, complying with the following requirements:

- a. Color boards shall reflect all actual finish textures, patterns, and colors required for this contract.
- b. Materials shall be labeled with the finish type, manufacturer's name, pattern, and color reference.
- c. Samples shall be on size A4 or 8-1/2 by 11 inch boards with a maximum spread of size A1 or 25-1/2 by 33 inches for foldouts.
- d. Samples for this color board are required in addition to samples requested in other specification sections.

PART 2 PRODUCTS

2.1 REFERENCE TO MANUFACTURER'S COLOR

Where color is shown as being specific to one manufacturer, an equivalent color by another manufacturer may be submitted for approval. Manufacturers and materials specified are not intended to limit the selection of equal colors from other manufacturers.

2.2 COLOR SCHEDULE

The color schedule lists the colors, patterns and textures required for exterior and interior finishes, including both factory applied and field applied colors.

2.2.1 Exterior Colors

Exterior wall colors shall apply to exterior surfaces including recesses at entrances and projecting vestibules. Conduit shall be painted to closely match the adjacent surface color. Wall color shall be provided to match the colors listed below.

2.2.1.1 15th Avenue South Pump Station D3

- a. Split Face Block: "Walnut" by Dillon.
- b. Corduroy Block: "Walnut" by Dillon.
- c. Fypon (paint): "Straw Doll SW1365" by Sherwin-Williams.
- d. Metal Standing Seam Roof and Parapet Caps, Gutters and Downspouts, Soffits, Copings, and Fascia Trim: "Buckskin" by Berridge.
- e. Cut Stone: "Northern Buff" by Vetter Stone Co.
- f. Mortar: To be selected after award.
- g. Railing System: Black.
- h. Louvers: Match "Roman Bronze" Kynar finish by Metal-Era Roof Edge System.
- i. Rolling Door, Hollow Metal Door Frame, Hollow Metal Door and Panels: "Dolphin SW1034" by Sherwin-Williams.
- j. Exhaust Stack: "Dolphin SW1034" by Sherwin-Williams.

2.2.1.2 Belmont Coulee Pump Station E1

- a. Ground Face Masonry Units: "Natural Medium Weight" by Trendstone..
- b. Cut Stone Accent Band: "Northern Buff" by Vetter Stone Co.
- c. Mortar: To be selected after award.
- d. Roof: "Charcoal Grey" by Berridge.
- e. Fascia Trim, Ridge Crest, Gutters, and Downspouts: Copper.
- f. Soffits: "Copper Penny" by Pac Clad.
- g. Railing System: Black.
- h. Louvers: "546 Seawolf" by MM Systems Co.
- i. Rolling Door: "Cubist Grey SW1022" by Sherwin-Williams.
- j. Hollow Metal Door and Panels: "Cubist Grey SW1022" by Sherwin-Williams.

## Grand Forks Phase 2 Levees

k. Hollow Metal Frame: "Cubist Grey SW1022" by Sherwin-Williams.

l. Exhaust Stack: "Charcoal Grey" to match roof.

### 2.2.1.3 8th Avenue North Pump Station C1

a. Brick: "Cranberry Velour" by Sioux City Brick and Tile Company.

b. Horizontal Brick Accent: "Cranberry Velour" by Sioux City Brick and Tile Company.

c. Asphalt Shingles: "Estate Grey" by Owens Corning.

d. Mortar: To be selected after award.

e. Rolling Door: "Straw Doll SW1365" by Sherwin-Williams.

f. Fascia Trim, Soffits, Downspouts and Gutters: "205 Versaille" by MM Systems Co.

g. Railing System: Black.

h. Louvers: "540 Cinnamon" by MM Systems Co.

i. Exhaust Stack: Match roof.

### 2.2.1.4 Trail Directional Signage

a. Pictographs and directional arrows: "Robinhood Green" by Pratt and Lambert.

b. Lettering and graphics on Pictographs, and directional arrows: "Silver Lining" by Pratt and Lambert.

### 2.2.1.5 Community Green Ornamental Railing

a. Railing System: "Leaf Green" by Tiger Drylac Powder Coatings.

### 2.2.1.6 Floodwalls

a. Mortar: Standard Grey.

b. Simulated Stone surfaces: To match floodwall cut stone.

## 2.2.2 Interior Colors

### 2.2.2.1 All Buildings

a. Concrete Block Walk, Structural Steel, and Metal Deck: "Spacious Grey SW1009" by Sherwin-Williams.

b. Hollow Metal Doors, Panels, and Frames: Match exterior colors.

## PART 3 EXECUTION (Not Applicable)

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 10 - SPECIALTIES

SECTION 10170

PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS

PART 2 PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
- 2.2 TOILET COMPARTMENTS
- 2.3 FABRICATION

PART 3 EXECUTION

- 3.1 INSPECTION
- 3.2 INSTALLATION
- 3.3 HARDWARE ADJUSTMENTS
- 3.4 PROTECTION AND CLEANING
- 3.5 FINAL ADJUSTMENTS

-- End of Section Table of Contents --

SECTION 10170

PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 666 (1999) Annealed or Cold-Worked Austenitic  
Stainless Steel Sheet, Strip, Plate, and  
Flat Bar

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Product Data; GA

Submit detailed material and fabrication specifications and installation instructions. Include catalog cuts of hardware, anchors, fastenings and other data as required.

SD-14 Samples

Color Selections; GA

Submit samples of manufacturer's standard colors for selection.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Subject to compliance with the specified requirements, provide plastic toilet compartments by Accurate Partitions Corp., Comtec Industries, General Partitions Manufacturing Corp., or approved equal

2.2 TOILET COMPARTMENTS

- a. Style: Floor-mounted, overhead-braced.
- b. Panels, Doors, and Pilasters: High-density polyethylene (HDPE) with homogenous color throughout. Provide material not less than 1 in.

thick with seamless construction and eased edges in color selected by Contracting Officer.

- c. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.312 in. thick and 3 in. high, finished to match hardware.
- d. Stirrup Brackets: Manufacturer's standard ear or U-brackets for attaching panels and screens to walls and pilasters of clear anodized aluminum or stainless steel.
- e. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of clear anodized aluminum or stainless steel.
- f. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.
- g. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.
- h. Coat Hook and Bumper: Inside compartment on in-swinging doors and outside of door on out-swinging doors of handicap accessible compartments if door opens against an adjacent wall.
- i. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of clear anodized aluminum or stainless steel.
- j. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

## 2.3 FABRICATION

Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated

Provide aluminum heat-sink strips at exposed bottom edges of HDPE units to prevent burning

Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

Provide wall hung screens in sizes indicated of same construction and finish as compartment panels.

Unless otherwise indicated, provide 24 inch wide in-swinging doors for standard toilet compartments and 36 inch wide out-swinging doors with a minimum 32 inch wide clear opening for compartments indicated to be handicapped accessible.



Provide the following for each door in compartment system:

- a. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return to fully closed position.
- b. Latch and Keeper: Recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
- c. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories
- d. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors
- e. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

### PART 3 EXECUTION

#### 3.1 INSPECTION

Examine substrates and conditions under which toilet compartments and related items are to be installed

Notify of conditions detrimental to proper and timely completion of the work

Do not proceed with the work until unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

Install compartments rigid, straight, plumb and level, with the panels laid out as shown. Provide clearances of not more than 1/2 inch between pilasters and panels, and not more than 1 inch between panels and walls. Locate wall bracket so that holes for wall anchorages occur in masonry or tile joints. Secure panels to supporting walls with manufacturer's recommended anchoring devices in accordance with shop drawings and manufacturer's instructions. Secure floor supports to the floor with not less than two lead expansion shields and sheet metal screws.

Secure pilasters to supporting floor with specified anchorage devices. Level, plumb, and tighten with leveling device. Set tops of doors parallel with overhead brace when doors are in the closed position.

Head rail shall extend across front of each toilet compartment and be securely anchored in a stainless steel wall bracket where it meets wall. End toilet compartment shall have an additional head rail running length of last panel and anchored securely to back wall

### 3.3 HARDWARE ADJUSTMENTS

Adjust and lubricate hardware for proper operation after installation.

### 3.4 PROTECTION AND CLEANING

Protect units during delivery, storage, and after erection so that there will be no indication of use or damage at the time of acceptance. Replace damaged work.

### 3.5 FINAL ADJUSTMENTS

Perform final adjustments to pilaster leveling devices, door hardware, and other operating parts prior to final inspection. Clean exposed surfaces of compartments, hardware, fittings and accessories, and touch up minor scratches and other finish imperfections using materials and methods recommended by compartment manufacturer.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 10 - SPECIALTIES

SECTION 10430

EXTERIOR SIGNAGE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL
- 1.3 CHARACTER PROPORTIONS AND HEIGHTS
- 1.4 SUBMITTALS
- 1.5 QUALIFICATIONS
- 1.6 DELIVERY AND STORAGE
- 1.7 WARRANTY

PART 2 PRODUCTS

- 2.1 REGULATORY SIGNAGE
- 2.2 GRAPHICS FOR EXTERIOR SIGNAGE SYSTEMS
  - 2.2.1 Graphics
  - 2.2.2 Messages
- 2.3 METAL PLAQUES AND MEDALLIONS
  - 2.3.1 Cast Metal Plaques
    - 2.3.1.1 Fabrication
    - 2.3.1.2 Size
    - 2.3.1.3 Graphics
    - 2.3.1.4 Background
    - 2.3.1.5 Mounting
    - 2.3.1.6 Finish
- 2.4 CAST BRONZE
- 2.5 ANCHORS AND FASTENERS
- 2.6 SHOP FABRICATION AND MANUFACTURE
  - 2.6.1 Factory Workmanship
  - 2.6.2 Dissimilar Materials
  - 2.6.3 Shop Painting
- 2.7 COLOR, FINISH, AND CONTRAST

PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Anchorage
  - 3.1.2 Protection and Cleaning
- 3.2 FIELD PAINTED FINISH

-- End of Section Table of Contents --

SECTION 10430

EXTERIOR SIGNAGE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |   |
|-------------------|---|
| ASTM A 123/A 123M | (2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products  |
| ASTM A 653/A 653M | (1999a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process |
| ASTM A 924/A 924M | (1999) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process                           |
| ASTM B 62         | (1993) Composition Bronze or Ounce Metal Castings   |

AMERICAN WELDING SOCIETY (AWS)

|          |  |
|----------|--|
| AWS D1.1 | (2000) Structural Welding Code - Steel |
|----------|--|

1.2 GENERAL

All exterior signage shall be provided by a single manufacturer. Exterior signage shall be of the design, detail, sizes, types, and message content shown on the drawings, shall conform to the requirements specified, and shall be provided at the locations indicated. Signs shall be complete with lettering, framing as detailed, and related components for a complete installation.

1.3 CHARACTER PROPORTIONS AND HEIGHTS

Characters and numbers on indicated signs shall be sized as shown.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Modular Exterior Signage System; GA

Manufacturer's descriptive data and catalog cuts.

Installation; GA

Manufacturer's installation instructions and cleaning instructions.

#### SD-04 Drawings

Approved Detail Drawings; GA

Drawings showing elevations of each type of sign; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message shall be included.

#### SD-14 Samples

Exterior Signs; GA

One 12 inch length of framing for signs. One sample of each type of sign. Each sample shall consist of a complete sign panel with letters and symbols. Samples may be installed in the work, provided each sample is identified and location recorded. Two samples of manufacturer's standard color chips for each material requiring color selection and 12 inch square sample of sign face color sample.

#### SD-19 Operation and Maintenance Manuals

Protection and Cleaning; GA

Six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include simplified diagrams for the equipment as installed.

### 1.5 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

### 1.6 DELIVERY AND STORAGE

Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

### 1.7 WARRANTY

Manufacturer's standard performance guarantees or warranties shall be provided.

## PART 2 PRODUCTS

### 2.1 REGULATORY SIGNAGE

Regulatory signage shall be as shown and in accordance with the Minnesota Manual on Uniform Traffic Control Devices (MMUTCD) designation shown.

## 2.2 GRAPHICS FOR EXTERIOR SIGNAGE SYSTEMS

### 2.2.1 Graphics

Signage graphics shall conform to the following:

Bronze letters, 1/4 inch thick shall be provided and fastened to the message panel with concealed fasteners. Letters shall project 3/4 inches from face of panel.

### 2.2.2 Messages

See drawings for message content. Typeface: As indicated. Type size as indicated.

## 2.3 METAL PLAQUES AND MEDALLIONS

Design and location of plaques and medallions shall be as shown.

### 2.3.1 Cast Metal Plaques

#### 2.3.1.1 Fabrication

Cast metal plaques shall have the logo, emblem and artwork cast in the bas relief technique. Plaques shall be fabricated from bronze.

#### 2.3.1.2 Size

Plaque size shall be as shown.

#### 2.3.1.3 Graphics

Graphics will be provided by City of Grand Forks.

#### 2.3.1.4 Background

Background texture shall be fine pebble.

#### 2.3.1.5 Mounting

Mounting shall be concealed.

#### 2.3.1.6 Finish

Finishes shall consist of bronze with dark finish oxidized background. Letters shall be satin polished and entire plaque sprayed with two coats of clear lacquer.

## 2.4 CAST BRONZE

Components shall be fabricated with sharp corners, flat faces, and accurate profiles. Burrs and rough spots shall be removed and polished. Faces shall be finished to a uniform high luster. Cast bronze shall be in accordance with ASTM B 62.

## 2.5 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall match in color and finish and shall be non-rusting, non-corroding, and non-staining. Exposed fasteners shall be tamper-proof.

## 2.6 SHOP FABRICATION AND MANUFACTURE

### 2.6.1 Factory Workmanship

Work shall be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled shall be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Welding to or on structural steel shall be in accordance with AWS D1.1. Welding shall be continuous along the entire area of contact. Exposed welds shall be ground smooth. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practical. Items specified to be galvanized shall be by hot-dip process after fabrication if practical. Galvanization shall be in accordance with ASTM A 123/A 123M and ASTM A 653/A 653M, as applicable. Other metallic coatings of steel sheet shall be in accordance with ASTM A 924/A 924M. Joints exposed to the weather shall be formed to exclude water. Drainage and weep holes shall be included as required to prevent condensation buildup.

### 2.6.2 Dissimilar Materials

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

### 2.6.3 Shop Painting

Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, shall be given one coat of zinc-molybdate primer or an approved rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice. Surfaces of items to be embedded in concrete shall not be painted. Upon completion of work, damaged surfaces shall be recoated.

## 2.7 COLOR, FINISH, AND CONTRAST

Color of products shall be as shown. Characters and symbols shall contrast with their background - either light characters on a dark background or dark characters on a light background.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Signs, plaques, or dimensional letters shall be installed in accordance with approved manufacturer's instructions at locations shown on the approved detail drawings. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed.

### 3.1.1 Anchorage

Anchorage and fastener materials shall be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

### 3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. Hardware and electrical equipment shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned in accordance with manufacturer's instructions. After signs are completed and inspected, the Contractor shall cover all project identification, directional, and other signs which may mislead the public. Covering shall be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Signs shall be cleaned, as required, at time of cover removal.

### 3.2 FIELD PAINTED FINISH

Miscellaneous metals and frames shall be field painted in accordance with Section 09900 PAINTING, GENERAL. Anodized metals, masonry, and glass shall be protected from paint. Finish shall be free of scratches or other blemishes.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 10 - SPECIALTIES

SECTION 10440

SIGNS

PART 1 GENERAL

- 1.1 SUBMITTALS
- 1.2 REGULATORY REQUIREMENTS
- 1.3 DELIVERY, STORAGE AND HANDLING

PART 2 PRODUCTS

- 2.1 SIGNS, GENERAL
- 2.2 SIGNS
- 2.3 ATTACHMENT DEVICES

PART 3 EXECUTION

- 3.1 INSTALLATION

-- End of Section Table of Contents --

SECTION 10440

SIGNS

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Signs; GA

Color Charts: Submit chart of color combinations for selection.

SD-04 Drawings

Signs; GA

Submit shop drawings, product data sheets, and schedules. Indicate type of sign, materials, dimensions, colors, graphics, and method of attachment.

1.2 REGULATORY REQUIREMENTS

Signs shall comply with the Americans with Disabilities Act (ADA) of 1990.

1.3 DELIVERY, STORAGE AND HANDLING

Ship sign materials including attachment devices carefully packaged to prevent surface damage. Include shop drawings to insure correct installation and arrangement of all materials.

PART 2 PRODUCTS

2.1 SIGNS, GENERAL

Signs which designate permanent rooms and spaces shall meet the following general requirements:

- a. Characters shall be raised 1/32 inch and shall be accompanied with Grade 2 braille.
- b. Raised characters shall be of height designated or shown, but not less than 5/8 inch, nor more than 2 inches.
- c. Pictograms, where designated, shall be accompanied by equivalent verbal description placed directly below pictogram. Border dimension of pictogram shall be 6 inches minimum in height.

All signs shall meet the following general requirements:

- a. Characters and background of signs shall be eggshell, matte, or other non-glare finish.
- b. Characters shall contrast with their background - either light characters on a dark background or dark characters on a light background.

Where specific text height and sign size requirements are specified below, those specific requirements shall govern over these general requirements.

## 2.2 SIGNS

Machine-cut copy characters and symbols from matte-finish opaque acrylic sheet and chemically weld onto the opaque acrylic sheet forming sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks. Pictogram/copy signs shall be 6 inches x 8 inches with rounded corners and 3/4 inch high helvetica medium, upper case characters. Provide international symbol of accessibility, graphics, and directional arrows as shown.

## 2.3 ATTACHMENT DEVICES

Provide adhesive suitable for attaching signs to exterior of building.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install signs in accordance with shop drawings and manufacturer's recommendations. Mounting heights and locations shall comply with ADA requirements.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 10 - SPECIALTIES

SECTION 10800

TOILET ACCESSORIES

PART 1 GENERAL

- 1.1 SUBMITTALS
- 1.2 DELIVERY, STORAGE, AND HANDLING
- 1.3 WARRANTY

PART 2 PRODUCTS

- 2.1 MANUFACTURED UNITS
  - 2.1.1 Anchors and Fasteners
  - 2.1.2 Finishes
- 2.2 ACCESSORY ITEMS
  - 2.2.1 Grab Bar (GB)
  - 2.2.2 Mirrors, Glass (M1)
    - 2.2.2.1 Mirrors
    - 2.2.2.2 Backing
    - 2.2.2.3 Hanger
    - 2.2.2.4 Frames
    - 2.2.2.5 Mirrors without Shelf
  - 2.2.3 Sanitary Napkin Disposer (SND)
  - 2.2.4 Soap Dispenser (SD)
  - 2.2.5 Robe Hook (RH)
  - 2.2.6 Toilet Paper Holder (TP)
  - 2.2.7 Mop and Broom Holder (MH)
  - 2.2.8 Electric Hand Dryer (HD)
  - 2.2.9 Diaper Changing Station (CS)

PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 CLEANING
- 3.3 SCHEDULE

-- End of Section Table of Contents --

SECTION 10800

TOILET ACCESSORIES

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Finishes; GA. Accessory Items; GA.

Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, operation instructions, and cleaning instructions.

1.2 DELIVERY, STORAGE, AND HANDLING

Toilet accessories shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area protected from construction damage and vandalism.

1.3 WARRANTY

Manufacturer's standard performance guarantees or warranties shall be provided.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

Toilet accessories shall be provided where indicated in accordance with paragraph SCHEDULE. Each accessory item shall be complete with the necessary mounting plates and shall be of sturdy construction with corrosion resistant surface.

2.1.1 Anchors and Fasteners

Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be suited for use with the supporting construction. Exposed fasteners shall be of tamperproof design and shall be finished to match the accessory.

2.1.2 Finishes

Except where noted otherwise, finishes on metal shall be provided as follows:

| <u>Metal</u>                             | <u>Finish</u>           |
|--|-------------------------|
| Stainless steel                          | No. 4 satin finish      |
| Carbon steel, copper alloy,<br>and brass | Chromium plated, bright |

## 2.2 ACCESSORY ITEMS

Accessory items shall conform to the requirements specified below.

### 2.2.1 Grab Bar (GB)

Grab bar shall be 18 gauge, 1-1/4 inches OD Type 304 stainless steel. Grab bar shall be form and length as indicated. Concealed mounting flange shall have mounting holes concealed. Grab bar shall have satin finish. Installed bars shall be capable of withstanding a 500 pound vertical load without coming loose from the fastenings and without obvious permanent deformation. Space between wall and grab bar shall be 1-1/2 inch.

### 2.2.2 Mirrors, Glass (M1)

#### 2.2.2.1 Mirrors

1/4 inch thick, No. 1 (mirror glazing) quality, clean polished plate/float mirror glass electrolytically copper plated, guaranteed against silver spoilage for 15 years.

#### 2.2.2.2 Backing

Backing shall be resilient, non-absorbent filler material, with not less than 22 gauge galvanized steel backing plate attached to frame with concealed screws, one-piece construction, full height and width of mirror frame. Corrugated cardboard or other moisture absorbent filler material is not acceptable.

#### 2.2.2.3 Hanger

Construct metal backing with hanger slots for concealed "tamper-proof" mounting. Provide manufacturer's standard hanger to engage with backing for concealed installation.

#### 2.2.2.4 Frames

Use one piece roll formed frames, not less than 22 gauge, satin finish, Type 304 stainless steel, with square corners heli-arc welded and ground smooth.

#### 2.2.2.5 Mirrors without Shelf

Provide of size as designated; Bobrick B-290 series.

### 2.2.3 Sanitary Napkin Disposer (SND)

Sanitary napkin disposal shall be constructed of Type 304 stainless steel with removable leak-proof receptacle for disposable liners. Fifty disposable liners of the type standard with the manufacturer shall be

## Grand Forks Phase 2 Levees

provided. Receptacle shall be retained in cabinet by tumbler lock. Disposer shall be provided with a door for inserting disposed napkins, and shall be surface mounted.

### 2.2.4 Soap Dispenser (SD)

4 inch Type 304 stainless steel spout, 16 ounce polyethylene liquid soap container; basin mounted.

### 2.2.5 Robe Hook (RH)

Robe hook shall have concealed wall fastenings, and a pin integral with or permanently fastened to wall flange. Maximum projection shall be 4 inches. Design shall be consistent with design of other accessory items. Finish shall be bright polish.

### 2.2.6 Toilet Paper Holder (TP)

Surface-mounted, double roll without controlled delivery.

### 2.2.7 Mop and Broom Holder (MH)

Satin finish stainless steel, with 3 anti-slip holders with spring loaded rubber cam, 24 inches.

### 2.2.8 Electric Hand Dryer (HD)

See Section 16600 ELECTRIC DRYERS.

### 2.2.9 Diaper Changing Station (CS)

Diaper changing station shall be surface mounted and shall be fabricated of high impact plastic with no sharp edges. Unit fold down platform shall be concave to the child's shape, equipped with nylon and velcro safety straps and engineered to withstand a minimum static load of 250 lb. Safety graphics shall be pictorial for universal use. Color shall be as shown in Section 09915 COLOR SCHEDULE.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Toilet accessories shall be securely fastened to the supporting construction in accordance with the manufacturer's approved instructions. Accessories shall be protected from damage from the time of installation until acceptance.

### 3.2 CLEANING

Material shall be cleaned in accordance with manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions shall be taken to avoid scratching or marring of surfaces.

### 3.3 SCHEDULE

Refer to drawings for schedule.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 14 - CONVEYING SYSTEMS

SECTION 14600

HOIST AND CRANES

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SYSTEM DESCRIPTION
  - 1.2.1 General Requirements
    - 1.2.1.1 Standard Products
    - 1.2.1.2 Nameplates
    - 1.2.1.3 Verification of Dimensions
    - 1.2.1.4 Welding
  - 1.2.2 Design Criteria
    - 1.2.2.1 Hoist Characteristics
    - 1.2.2.2 Monorail Characteristics
    - 1.2.2.3 Capacity Plates
  - 1.2.3 Definitions
    - 1.2.3.1 Capacity
    - 1.2.3.2 Hoisting Speed
    - 1.2.3.3 Rated Lift
    - 1.2.3.4 Headroom
    - 1.2.3.5 Minimum Radius
    - 1.2.3.6 Trolley Speed
- 1.3 SUBMITTALS
- 1.4 DELIVERY AND STORAGE

PART 2 PRODUCTS

- 2.1 ELECTRIC HOIST
  - 2.1.1 General
  - 2.1.2 Types of Electric Hoists
    - 2.1.2.1 Electric Wire Rope Hoist
  - 2.1.3 Load and Motor Brakes
- 2.2 HOIST MECHANICAL EQUIPMENT
  - 2.2.1 Wire Rope Hoist
    - 2.2.1.1 Hoist Wire Rope
    - 2.2.1.2 Hoist-Rope Drum
    - 2.2.1.3 Hoist Load Block and Sheaves
  - 2.2.2 Hoist Hook Assembly
  - 2.2.3 Hoist Gear Assembly
    - 2.2.3.1 Gears
    - 2.2.3.2 Gear Shafts
    - 2.2.3.3 Gear Train Assembly
  - 2.2.4 Hoist Bearings
    - 2.2.4.1 Antifriction Bearings
    - 2.2.4.2 Factory Sealed Bearings
  - 2.2.5 Hoist Lubrication
  - 2.2.6 Hoist Frame and Housing
  - 2.2.7 Hoist Paint Finish



- 2.3 TROLLEYS
  - 2.3.1 Paint
  - 2.3.2 Wheels
    - 2.3.2.1 Load Distribution
    - 2.3.2.2 Design and Type
    - 2.3.2.3 Bearings
  - 2.3.3 Side Plates, Pins, and Axles
    - 2.3.3.1 Side Plates
    - 2.3.3.2 Pins and Axles
  - 2.3.4 Gearing
    - 2.3.4.1 Gears
    - 2.3.4.2 Drive Pinions
    - 2.3.4.3 Clamps
  - 2.3.5 Safety Hangers or Lugs
- 2.4 TROLLEY TYPE
  - 2.4.1 Electric-Motor-Driven Trolleys
- 2.5 MONORAIL TRACK
  - 2.5.1 Track Design
  - 2.5.2 Flanges
  - 2.5.3 Miscellaneous Track Items
    - 2.5.3.1 Splice Plates and Fasteners
    - 2.5.3.2 Safety End Stops
    - 2.5.3.3 Fittings
  - 2.5.4 Finishing
- 2.6 ELECTRICAL
  - 2.6.1 Power Supply
    - 2.6.1.1 Trolley Power Supply
  - 2.6.2 Motor Controller
    - 2.6.2.1 Contactor Fingers
    - 2.6.2.2 Transformer
    - 2.6.2.3 Enclosure for Mounting
  - 2.6.3 Pendant Control Station
  - 2.6.4 Mainline Disconnect Switch
  - 2.6.5 Hoist Limit Switches
  - 2.6.6 Trolley Travel Limit Switches
  - 2.6.7 Hoist Motors
  - 2.6.8 Trolley Motors
  - 2.6.9 Motor Brake
  - 2.6.10 Conduit and Wire
    - 2.6.10.1 Conduit
    - 2.6.10.2 Wire

### PART 3 EXECUTION

- 3.1 ERECTION
- 3.2 INSTALLATION OF MONORAIL TRACK
- 3.3 ONSITE ELECTRIFICATION SYSTEM TESTS
- 3.4 ACCEPTANCE TESTING
  - 3.4.1 Acceptance Test
    - 3.4.1.1 Test Sequence
    - 3.4.1.2 Test Data
    - 3.4.1.3 Equipment Monitoring
    - 3.4.1.4 Hooks
  - 3.4.2 No-Load Testing
    - 3.4.2.1 Hoist Operating and Limit Switch Test
    - 3.4.2.2 Trolley Travel
    - 3.4.2.3 Hoist Loss of Power No-Load Test
    - 3.4.2.4 Travel Loss of Power No-Load Test
  - 3.4.3 Load Test

Grand Forks Phase 2 Levees

- 3.4.3.1 Hoist
- 3.5 MANUFACTURER'S SERVICES
- 3.6 FIELD TRAINING

-- End of Section Table of Contents --

SECTION 14600

HOIST AND CRANES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN BEARING MANUFACTURERS ASSOCIATION (AFBMA)

AFBMA Std 9 (1990) Load Ratings and Fatigue Life for Ball Bearings

AFBMA Std 11 (1990) Load Ratings and Fatigue Life for Roller Bearings

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)

AGMA 9005-D (1994) Industrial Gear Lubrication

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C80.1 (1995) Rigid Steel Conduit - Zinc Coated

ANSI MH27.1 (1996) Cranes and Monorail Systems, Underhung

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M (1997a<sup>1</sup>) Carbon Structural Steel

ASTM B 633 (1998) Electrodeposited Coatings of Zinc on Iron and Steel

ASTM E 10 (1998) Brinell Hardness of Metallic Materials

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2000) Structural Welding Code - Steel

FEDERAL SPECIFICATIONS (FS)

FS RR-W-410 (Rev D; Am 1) Wire Rope and Strand

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6 (1993) Industrial Control and Systems, Enclosures

NEMA KS 1 ((1996) Enclosed and Miscellaneous  
Distribution Equipment Switches (600 Volts  
Maximum)

NEMA WC 3 (1992; Rev 1) Rubber-Insulated Wire and  
Cable for the Transmission and  
Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 50 (1995; Rev thru Nov 1999) Enclosures for  
Electrical Equipment

UL 674 (1994; Rev thru Oct 1998) Electric Motors  
and Generators for Use in Division 1  
Hazardous (Classified) Locations

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

1.2.1.1 Standard Products

Materials and equipment shall be standard products of manufacturers regularly engaged in the fabrication of cranes and hoists and shall essentially duplicate items which have been in satisfactory use for at least 2 years prior to bid opening. Any company licensed by a crane and hoist manufacturer to manufacture cranes and hoists bearing their name shall have the design and components approved by the licensor prior to submission to the Government for approval.

1.2.1.2 Nameplates

Each major component of equipment shall have the manufacturer's name, address, type or style, model or catalog number, and serial number on a metal plate secured to the equipment.

1.2.1.3 Verification of Dimensions

The Contractor shall verify all dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing any work.

1.2.1.4 Welding

Welding shall be in accordance with AWS D1.1.

1.2.2 Design Criteria

The hoist(s) shall be designed to operate in the spaces indicated.

1.2.2.1 Hoist Characteristics

Hoist shall be an electric-wire rope hoist of operating characteristics specified. Each hoist shall have the capacity, lift-height, suspension, power source, and operating characteristics indicated and as follows:

- a. Each hoist shall have the capacity indicated on drawings.
- b. Each hoist shall have the minimum height of lift indicated on drawings.
- c. The hoist shall be the lug-suspension type mounted on an electric-motor-driven trolley.
- d. Components of the hoist shall be designed and constructed for safety of operation and durability of components. Replacement parts shall be interchangeable and readily accessible.

#### 1.2.2.2 Monorail Characteristics

The monorail shall be of the wide flange or patented beam style.

#### 1.2.2.3 Capacity Plates

Two capacity plates shall be provided, one for each side of the bridge. Each plate shall be lettered to indicate the total rated hoisting capacity of the crane. All lettering shall be of sufficient size to be easily read from the floor.

#### 1.2.3 Definitions

##### 1.2.3.1 Capacity

Capacity shall mean the rated load in pounds, or tons of 2,000 pounds each, specified by the manufacturer for the hoist and marked plainly on the hoist and loadblock so as to be clearly legible. In determining the applied load, the weight of the handling devices shall be included.

##### 1.2.3.2 Hoisting Speed

Hoisting speed shall mean the velocity in feet per minute at which the hoist will lift the rated load. Actual lifting speed shall be within plus or minus 10 percent of the manufacturer's rating.

##### 1.2.3.3 Rated Lift

Rated lift shall mean the distance between the upper and lower elevations of travel of the load block.

##### 1.2.3.4 Headroom

Headroom shall be measured with the load hook in the highest position with full load which is the distance between the saddle of the load hook and the following points:

- a. The bottom of the beam when S-shape runways are used.
- b. The top of the bottom flange for all flat, wheel-bearing flange surfaces.

##### 1.2.3.5 Minimum Radius

Minimum radius shall mean the smallest radius to the centerline of the beam or track on which the trolley will operate properly.

#### 1.2.3.6 Trolley Speed

Trolley speed shall mean the velocity in feet per minute at which a motor-driven trolley with hoist will travel carrying the rated load on level track; actual speed shall be within plus or minus 10 percent of the manufacturer's rating.

#### 1.3 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

##### SD-01 Data

Hoist Hook Assembly; GA  
Heat Treatment; FIO

Record of hook material and any heat treatment performed shall be submitted and shall be stamped on the hook shank or documented in certification papers furnished with the hooks.

Hoist; GA

Manufacturer's catalog data shall be submitted showing the equipment and accessories to be provided.

##### SD-04 Drawings

Wiring and Schematic diagrams; GA

Detailed drawings shall be submitted containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout, anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

##### SD-09 Reports

Electrification System Tests; GA

Results of electrification system tests shall be submitted.

Acceptance Testing; GA

Test reports in booklet form shall be submitted showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. The report shall include the information as required by paragraph ACCEPTANCE TESTING.

##### SD-13 Certificates

Hoist; GA

Track Design; GA  
Hoist controls; GA

Certification shall be submitted attesting that each hoist, hoist trolley and track, and hoist control has been factory tested for rated load capacity and operation, and that each hoist complies with the requirements specified.

Electric Hoists; GA  
Trolleys; GA  
Wiring; GA  
Contact Conductors; GA  
Hoist Controls; GA  
Overcurrent Protection; GA  
Grounding; GA

Certification shall be submitted attesting that electric hoists, trolleys, wiring, contact conductors, controls, overcurrent protection, and grounding conform to NFPA 70 and to UL standards. The label or listing with reexamination by the UL will be accepted as evidence that the materials conform to this requirement and to NFPA 70.

#### SD-19 Operation and Maintenance Manuals

Operation Manuals; GA

Two copies of operation manuals shall be furnished for each hoist. Operation manuals shall detail the step-by-step procedures required for system startup, operation, and shutdown. Operation manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their operating features. Operation manuals shall include a copy of the acceptance test report for information and future reference. Operation manuals shall include an overall description of the system describing any unique features that may need special attention.

Maintenance Manuals; GA

Two copies of maintenance manuals shall be furnished for each hoist. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping, layout diagrams, equipment layout diagrams, and wiring and control diagrams of the system as installed. Maintenance manuals shall include a spare parts list of manufacturers recommended spare parts that should be maintained onsite and any long lead time items should be clearly identified. Maintenance manuals shall contain replacement part numbers for the entire assembly.

#### 1.4 DELIVERY AND STORAGE

Equipment delivered shall be placed in indoor storage, protected from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

#### PART 2 PRODUCTS

## 2.1 ELECTRIC HOIST

### 2.1.1 General

Electric hoist shall be of capacity, lift, type, suspension, headroom, and materials specified. Each unit shall be factory wired and ready for operation. Load-carrying parts of the hoist shall be designed so that the calculated static stress of the material, based on the rated capacity, will not exceed 20 percent of the average theoretical strength of the material. Each hoist shall be factory lubricated and shall be complete and ready for operation with the specified hoist controls and accessories. Hoist hook clearance required shall be from bottom of hook to floor.

E1: 13 feet  
D3 and C1: 16 feet

### 2.1.2 Types of Electric Hoists

#### 2.1.2.1 Electric Wire Rope Hoist

Electric wire rope hoists shall be equipped with the specified standard rope and hook assembly, with no corroding or sparking requirements.

### 2.1.3 Load and Motor Brakes

Load brake shall be a totally enclosed, automatic, mechanical-type brake with a hardened-steel, Weston-type ratchet and pawl mechanism that will hold the capacity load of the hoist at any point when the motor is stopped. Motor brakes are specified in paragraph MOTOR BRAKE.

## 2.2 HOIST MECHANICAL EQUIPMENT

### 2.2.1 Wire Rope Hoist

#### 2.2.1.1 Hoist Wire Rope

Wire rope for standard applications shall be extra flexible, preformed, extra improved or improved plow steel, 6 by 37 fiber core sealed construction wire conforming to FS RR-W-410, Type I, Class 3.

Wire rope shall be anchored to drum or dead end. Anchoring shall be of captive type, easily detached for changing and repair. Wire rope shall have a factor of safety of not less than 5, based on the minimum ultimate tensile strength of the material.

#### 2.2.1.2 Hoist-Rope Drum

Wire-rope drum shall be hardened steel or special grade alloy ductile iron.

Minimum diameter of the drum shall be 20 times the diameter of the hoisting rope for hoists with a capacity of 2,000 pounds or less and 24 times the diameter of the hoisting rope for hoists over 2,000-pound capacity. Drum shall have accurate, machine-cut grooves, cut to full depth of wire-rope diameter, with rounded corners of dimension as required for the specified lift. In addition, the drum shall have not less than two complete turns of rope around it when the hook is in its lowest position. Groove diameter and pitch centers shall be 1/32 inch greater than diameter of rope. Drum shall be flanged at each end and shall have enclosed tops and sides to preclude cable binding and jamming. Cable reeving shall be arranged for double reeving. Hook shall remain centered under the drum at



all times.

#### 2.2.1.3 Hoist Load Block and Sheaves

The cable load block shall be an enclosed, safety type that will shroud the sheave and protect the operator. The sheave assembly shall be mounted on a steel axle and carried on sealed, prelubricated antifriction bearings. Wire-rope sheaves shall be machine-grooved, hardened steel, or cast iron with chilled groove surfaces. The pitch diameter for running sheaves shall be not less than 18 times the diameter of the wire rope, and the diameter of the idler and equalizer sheaves shall be not less than 16 times the diameter of the rope used.

#### 2.2.2 Hoist Hook Assembly

Hooks and hook swivels shall be heat-treated alloy steel forgings. Yokes, crossheads, and bars shall be of suitable strength steel or cast iron.

Hook assembly for electric-operated hoists shall be carried on antifriction bearings to permit free swivel under rated capacity load without twisting load chain or wire. Each hook shall have a spring-loaded safety latch. Each hook assembly shall include a machined and threaded shaft and swivel locknut with an effective locking device to prevent nut from backing off.

#### 2.2.3 Hoist Gear Assembly

##### 2.2.3.1 Gears

Gears shall be spur, helical, spiral, or bevel-type, accurately machined, and conforming to AGMA standards for this type of service.

##### 2.2.3.2 Gear Shafts

Gear shafts shall be manufactured from high-carbon steel or alloy steel, machined and ground for accurate fit, and splined for fitting to the mating gear.

##### 2.2.3.3 Gear Train Assembly

Gear train assembly shall be totally enclosed in the hoist frame casting and shall operate in a sealed oil bath. Frame casting shall be provided with lubrication fittings and inspection ports.

#### 2.2.4 Hoist Bearings

##### 2.2.4.1 Antifriction Bearings

Bearings in the hoist mechanism of electric-hoists shall be antifriction bearings.

##### 2.2.4.2 Factory Sealed Bearings

Sprocket bearings, motor bearings, and load-block bearings shall be prelubricated factory sealed bearings.

#### 2.2.5 Hoist Lubrication

Adequate lubrication shall be provided for moving parts of the hoist and trolley and for filling, draining, and checking the level of the lubricant.

Lubricant shall be designed for use in an ambient temperature of 30 to 100 degrees F. Hoist reduction gearing, load brake, and trolley wheel gears with electric motor drive shall operate in an oil bath. Lubrication and mechanism housing shall prevent leaking and shall prevent lubricant from coming into contact with electric motors and equipment. Lubricant shall conform to AGMA 9005-D.

#### 2.2.6 Hoist Frame and Housing

Operating parts of the hoist shall be mounted and enclosed in a sealed, factory-painted metal frame of malleable iron, cast steel, welded steel, or aluminum. Welded or bolted frames shall carry loads on the fabricated pieces. Welds or bolts shall be used only to hold the fabricated parts in position.

#### 2.2.7 Hoist Paint Finish

Each hoist and accessory shall receive a factory-applied paint finish. Hooks shall not be painted.

### 2.3 TROLLEYS

#### 2.3.1 Paint

Each trolley assembly shall be factory-painted, designed specifically for use with the specified hoist, and shall be furnished by the hoist manufacturer. Paint finish shall be the same type and quality specified for the hoist.

#### 2.3.2 Wheels

##### 2.3.2.1 Load Distribution

Each trolley assembly shall have not less than four wheels. Sufficient wheels shall be provided to properly distribute the load. The load on a wheel shall not exceed  $1,200 \frac{DW}{D}$  pounds where D equals the diameter of the wheel in inches and W equals the width of the rail head or the nominal length of bearing on the tread.

##### 2.3.2.2 Design and Type

Wheels shall be single-flange type manufactured from forged alloy steel with machined, hardened treads and flanges, or high-strength cast or nodular iron with machined flanges and treads, chill-hardened not less than 1/16 inch deep. Flanged wheels for motor-driven trolleys shall have treads and flanges hardened to not less than No. 320 Brinell hardness. Manually driven, trolley-wheel treads shall be hardened to not less than Brinell hardness No. 245 as defined in ASTM E 10. Wheels shall be designed to operate on sloped or flat flange I-beams.

##### 2.3.2.3 Bearings

Trolley wheels shall be carried on sealed, permanently lubricated, antifriction bearings designed for axial and thrust loading. Bearings shall conform to the applicable requirements of AFBMA Std 9 and AFBMA Std 11. Bearings shall have an L-10 life of 3,000 hours or more, as defined by AFBMA Std 9 or AFBMA Std 11 as applicable.

#### 2.3.3 Side Plates, Pins, and Axles

#### 2.3.3.1 Side Plates

Side plates shall be fabricated from structural-quality rolled-steel plate milled to the required profile with integral bosses where necessary to support equalizing pins; side plates shall be fitted with steel end bumpers.

#### 2.3.3.2 Pins and Axles

Equalizing pins and axles shall be heat-treated alloy steel, machined and finish ground to the required size.

#### 2.3.4 Gearing

##### 2.3.4.1 Gears

Gears shall be cut from heat-treated alloy steel accurately machined into spur, helical, and pinion gears, conforming to AGMA requirements.

##### 2.3.4.2 Drive Pinions

Drive pinions shall be carburized alloy steel, malleable iron, or bronze, with cut or cast teeth, conforming to AGMA requirements.

##### 2.3.4.3 Clamps

Plain trolleys and geared, manual-drive trolleys shall have suitable, quick-acting, steel track clamps. Clamps shall be adjustable for wear and shall not injure track flanges. They shall function satisfactorily on curved and straight track and shall be capable of withstanding a pull equivalent to one-third the rated capacity of the hoist when executed parallel to the track.

#### 2.3.5 Safety Hangers or Lugs

Safety hangers or lugs shall be steel and shall be integral with, or fastened to, each hoist frame or to trolley frame. They shall ride free above the bottom flange of the beam. Hanger shall be of sufficient capacity to hold the hoist, fully loaded, in the I-beam in case of wheel or axle failure. Safety factor of each part of trolley assembly shall be not less than 5, based on the ultimate strength of the material used.

#### 2.4 TROLLEY TYPE

##### 2.4.1 Electric-Motor-Driven Trolleys

Trolley shall be an electric-motor-driven geared type conforming to NFPA 70, the specified general trolley requirements, and the requirements specified.

Trolley speed shall be not more than 75 feet per minute.

#### 2.5 MONORAIL TRACK

Monorail track, splice plates, and hangers shall be painted, hot-rolled AISC structural steel "S" shapes or "W" shapes and plates conforming to ASTM A 36/A 36M, of size and weight as required for the specified hoist. The upper surface of the lower flange shall be free from bumps, depressions, and irregularities.

#### 2.5.1 Track Design

The track shall be designed with a minimum safety factor of 5. Deflection of track shall not exceed  $1/450$  of the span, as determined by total load of trolley, track, hoist, and full-capacity load. Track curve radii shall permit smooth trolley operation without binding.

#### 2.5.2 Flanges

Flanges shall be smoothly curved and without deformation.

#### 2.5.3 Miscellaneous Track Items

Necessary clamps, hanger rods, hangers, track splice plates, safety end stops, fasteners, and fittings shall be provided as required for a complete system.

##### 2.5.3.1 Splice Plates and Fasteners

Web-type splice plates or other suitable couplings shall be installed at track joints to provide flush and level connections, with maximum gap between adjacent ends at load-carrying ends not exceeding  $1/16$  inch;  $3/16$  inch at switches. Splice fasteners shall be regular hexagon or special, flat-head fasteners.

##### 2.5.3.2 Safety End Stops

Safety stops capable of withstanding the impact of a fully loaded hoist and trolley shall be provided.

##### 2.5.3.3 Fittings

Fittings with means for not less than 1 inch vertical adjustment of the track for level erection shall be provided, with provision for additional adjustment after the system has been in operation.

#### 2.5.4 Finishing

The finished monorail shall be inspected after erection, and fasteners, welds, abrasions, and handling marks shall be painted in the finish color. Brackets and hangers of the monorail electrification system shall be painted in the finish color of the monorail track.

#### 2.6 ELECTRICAL

Materials and installation, including electrical wiring, contact conductors, controls, overcurrent protection, and grounding shall meet the requirements of NFPA 70 and applicable UL and NEMA standards and specified requirements.

##### 2.6.1 Power Supply

Electrical power for operation of the hoist will be supplied from the nominal 480 volt, 3 phase, 60-Hz alternating-current (a-c) power distribution system.

##### 2.6.1.1 Trolley Power Supply

Power may be brought to the trolley by a cable reel or a festoon system.

- a. Festoon system shall consist of flexible power cable supported by cable trolleys running on a steel messenger cable, an I-beam rail, or a channel. The power cable shall be type G, 75-degree C, 600-volt insulation and heavy-duty neoprene or chlorosulfonated polyethylene jacket. The cable shall be sized as required by NFPA 70. The cable shall conform to the applicable requirements of NEMA WC 3, Part 7, and shall have class H or class K stranding. Cable conductors shall be terminated at both ends with terminal lugs on terminal blocks in terminal boxes. Cable ends shall have strain relief devices to protect the cable terminations.

#### 2.6.2 Motor Controller

Motor controller shall be a reversing-type magnetic starter with thermal-overload protection, molded case circuit breaker, and control transformer operated by a pushbutton control station. Controller and control station shall be mechanically or electrically interlocked to preclude possibility of operating opposing control circuits simultaneously.

##### 2.6.2.1 Contactor Fingers

Contacting fingers shall be adjustable and shall have renewable tips.

##### 2.6.2.2 Transformer

Transformer shall reduce the control-circuit voltage to 120 volts AC.

##### 2.6.2.3 Enclosure for Mounting

Motor controller shall be mounted in a gasketed sheet metal enclosure with hinged door conforming to the requirements of UL 50. Motor controller enclosures, complying with NEMA ICS 6, shall be NEMA, Type 12.

#### 2.6.3 Pendant Control Station

Each hoist shall have a pendant-mounted conductor cable and pushbutton station with a strain-reliever chain or cable permanently attached to the hoist frame and integral with the pendant conductor cable. The control station shall be a full-guarded, momentary-contact, pushbutton type with each button clearly marked to indicate its function. A separate button or a single button providing steps for each speed of multispeed hoists or trolleys shall be provided. The pushbuttons shall return to the off (normally open contacts) position when pressure is released by operator. The pushbutton station shall be grounded to the hoist. The strain reliever chain or cable shall not be used as a grounding circuit.

#### 2.6.4 Mainline Disconnect Switch

A mainline disconnect switch shall be provided and shall be a surface-mounted, heavy-duty, single-throw, air-break, enclosed type conforming to NEMA KS 1 as indicated. Disconnect switch shall be fused. Enclosure shall be NEMA Type 12.

#### 2.6.5 Hoist Limit Switches

Adjustable upper-limit switch shall be provided to prevent overtravel of the hook or load block in the hoisting direction. Limit switch shall be arranged to stop the hoist motor and apply the motor brake before reaching

the uppermost safe limit of travel. In case of hook overtravel, the motor shall automatically and momentarily be reversed. Adjustable lower-limit switch shall be provided to stop the hoist motor and apply the motor brake when the load hook reaches a predetermined lower limit.

#### 2.6.6 Trolley Travel Limit Switches

Limit switches shall be mounted to the trolley, respectively, to interrupt current to the trolley controls. Adjustable limit switch actuators shall be installed on both ends to actuate the limit switches and stop the crane trolley prior to contacting the bumpers.

#### 2.6.7 Hoist Motors

Hoist motor shall be a high-starting torque, high-slip, 30-minute time rated, reversible electric motor specifically designed for hoist duty and capable of operating at the specified duty class, capacity, and speed. The motor shall be 480-volts, 3-phase, 60-hertz and horsepower as recommended by manufacturer for capacity and lift speed of hoist. The hoist motors shall be provided with Class B insulation, and motor enclosures shall be totally enclosed, nonventilated (TENV). Enclosure shall be fitted with a UL-approved drain and breather and shall be certified and labeled in accordance with UL 674, Class 1, Groups C and D.

#### 2.6.8 Trolley Motors

Trolley motors shall be single-speed, single-winding conforming to the requirements for hoist motors except they may be NEMA design B (high torque and slip not required).

#### 2.6.9 Motor Brake

Motor brake shall be an externally adjustable, electrically operated single- or multiple-friction disk brake that shall apply automatically when the power is off. The brake shall be capable of holding 125 percent of the rated load from any operating speed. The brake shall hold a static load equal to 150 percent of the rated capacity of the hoist.

Trolley unit shall have an automatic, adjustable, solenoid-operated, electric brake designed for trolley application. Brake shall apply and release smoothly during starts and stops to minimize pendulum action of the load. Braking torque shall be not less than 100 percent of motor torque and shall match motor torque characteristics.

#### 2.6.10 Conduit and Wire

##### 2.6.10.1 Conduit

Conduit between feeder enclosure and disconnect switches and fixed control stations shall be zinc-coated rigid-steel conduit, couplings, elbows, bends, and nipples conforming to ANSI C80.1. Zinc coating shall be an electrodeposited coating conforming to ASTM B 633.

##### 2.6.10.2 Wire

Building wire for use in conduits, raceways, and wireways in wet or dry locations shall be coordinated with requirements of Section 16120 INSULATED WIRE AND CABLE.

## PART 3 EXECUTION

### 3.1 ERECTION

Erection shall be in accordance with the manufacturer's instructions.

### 3.2 INSTALLATION OF MONORAIL TRACK

Monorail tracks shall be installed in accordance with the applicable requirements of ANSI MH27.1. Tracks shall be accurately assembled to the lines and elevations indicated. Fastening of splices shall be performed after the abutting surfaces have been brought completely in contact. Connections shall be bolted or welded connections. Splices will be permitted only when indicated. Erection bolts used in welded construction may be tightened securely and left in place when they form no interference to trolley operation. If erection bolts are removed, the holes shall be plug welded and ground smooth. Monorail track shall be installed plumb and level to a tolerance of not more than 1 inch in 100 feet from the indicated elevation. The track shall be free of burrs, kinks, and deformation. Curves shall be smooth and even with no kinks or sharp bends. Track flanges shall be smooth and level. Welded joints and connections shall be ground smooth and offer no obstruction to trolley-wheel movement.

### 3.3 ONSITE ELECTRIFICATION SYSTEM TESTS

Electrification system shall be given continuity and insulation tests after the installation has been completed but before equipment is energized. Contractor shall provide necessary test equipment, labor, and personnel to perform the tests as specified. Electrification system equipment shall be completely isolated from all extraneous electrical connections. Substation and switchboard feeder breakers, circuit breakers in panelboards, and other disconnecting devices shall be used to isolate the equipment under test. Insulation tests on equipment and wiring shall be conducted using a 1,000-volt, insulation-testing instrument. Readings shall be recorded every minute and until three equal and consecutive readings are obtained. The resistance between phase conductors and between phase conductors and ground shall be not less than 1 megohm. Test data shall be recorded and shall include megohm readings versus time. Final acceptance shall depend upon satisfactory performance under test. Electrification system shall not be energized until recorded test data of the electrification system tests are approved.

### 3.4 ACCEPTANCE TESTING

Acceptance testing shall comply with the following paragraphs.

#### 3.4.1 Acceptance Test

The Contractor shall provide all personnel necessary to conduct the tests including but not limited to operators, riggers, rigging gear, and test weights. Testing shall be performed in the presence of Contracting Officer. The Contractor shall notify the Contracting Officer 7 days prior to testing operations.

##### 3.4.1.1 Test Sequence

The equipment shall be tested according to the applicable paragraphs of this procedure in the sequence provided.

#### 3.4.1.2 Test Data

Operating and startup current measurements shall be recorded for electrical equipment (motors and coils) using appropriate instrumentation. Speed measurements shall be recorded as required by the facility evaluation tests (normally at 100-percent load). Recorded values shall be compared with design specifications or manufacturer's recommended values; abnormal differences shall be explained in the remarks and submitted for approval or appropriate adjustments performed. In addition, high temperatures or abnormal operation of any equipment or machinery shall be noted, investigated, and corrected. Hoist and trolley speeds should be recorded during each test cycle.

#### 3.4.1.3 Equipment Monitoring

During the load test, improper operation or poor condition of safety devices, electrical components, mechanical equipment, and structural assemblies shall be monitored. Observed defects critical to continued testing shall be reported immediately to the Contracting Officer and testing shall be suspended until the deficiency is corrected. During and immediately following each load test, the following inspections shall be made:

- a. Inspect for evidence of bending, warping, permanent deformation, cracking, or malfunction of structural components.
- b. Check for overheating in brake operation; check for proper stopping. All safety devices, including emergency stop switches and POWER OFF pushbuttons, shall be tested and inspected separately to verify proper operation of the brakes.
- c. Check for abnormal noise or vibration and overheating in machinery drive components.
- d. Check wire rope sheaves and drum spooling for proper operation, freedom of movement, abnormal noise, or vibration.
- e. Check electrical drive components for proper operation, freedom from chatter, noise, or overheating.
- f. Inspect external gears for abnormal wear patterns, damage, or inadequate lubrication.

#### 3.4.1.4 Hooks

Hooks shall be measured for hook-throat spread before and after load test. A throat dimension base measurement shall be established by installing two tram points and measuring the distance between these tram points (to within 1/64 inch). This base dimension shall be recorded. The distance between tram points shall be measured before and after load test. An increase in the throat opening by more than 1 percent from the base measurement shall be cause for rejection.

#### 3.4.2 No-Load Testing

##### 3.4.2.1 Hoist Operating and Limit Switch Test

The load hook shall be raised and lowered through the full range of normal travel at rated speed and other speeds of the crane. The load hook shall



be stopped below the geared limit switch upper setting. In slow speed only, proper operation of upper and lower limit switches shall be verified. The test shall be repeated a sufficient number of times (minimum of three) to demonstrate proper operation. Brake action shall be tested in each direction.

#### 3.4.2.2 Trolley Travel

The trolley shall be operated the full distance of the monorail rails exercising all drive speed controls in each direction. Brake operation shall be verified in each direction. In slow speed, the trolley bumpers shall contact the trolley stops located on the rails.

#### 3.4.2.3 Hoist Loss of Power No-Load Test

The hooks shall be raised to a height of approximately 6 feet or less. While slowly lowering the hook, the main power source shall be disconnected verifying that the hook will not lower and that the brake will set.

#### 3.4.2.4 Travel Loss of Power No-Load Test

With the hook raised to clear obstructions and the trolley traveling in slow speed, the main power source shall be disconnected, verifying that the trolley will stop and that the brake will set.

#### 3.4.3 Load Test

##### 3.4.3.1 Hoist

Unless otherwise indicated, the following tests shall be performed using a test load of 125 percent of rated load.

- a. Dynamic Load Test: The test load shall be raised and lowered through the full-range while operating in each speed. The machinery shall be completely stopped at least once in each direction to ensure proper brake operation.
- b. Hoist Loss of Power Test: After raising the test load to approximately 6 feet above ground level and while slowly lowering the test load, the main power source and the control pushbutton shall be released verifying that the brake will set and that the test load will stop lowering.
- c. Trolley Dynamic Load Test: While operating the trolley the full distance of the monorail rails in each direction with test load on the hook (one cycle), the proper functioning of drive speed control points and proper brake action shall be tested.

#### 3.5 MANUFACTURER'S SERVICES

Services of a manufacturer's representative who is experienced in the installation, adjustment, erection, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.

#### 3.6 FIELD TRAINING

A field training course shall be provided for designated operating staff members. Field training shall cover all of the items contained in the

operating and maintenance instructions. The Contracting Officer shall be given at least 2 weeks advance notice of such training.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15050

SLUICE GATES AND OPERATORS

PART 1 GENERAL

- 1.1 SCOPE
- 1.2 REFERENCES
- 1.3 SUBMITTALS

PART 2 PRODUCTS

- 2.1 GENERAL REQUIREMENTS
  - 2.1.1 General Design
- 2.2 MATERIALS
  - 2.2.1 Structural Steel
  - 2.2.2 Naval Brass
  - 2.2.3 Manganese Bronze
  - 2.2.4 Cold Rolled Steel
  - 2.2.5 Stainless Steel
  - 2.2.6 Bolting Materials
  - 2.2.7 Asphalt Liquid
  - 2.2.8 Sand
  - 2.2.9 Seals
- 2.3 SLUICE GATES
  - 2.3.1 General
  - 2.3.2 Wall Thimbles
  - 2.3.3 Frames
  - 2.3.4 Gate Leaves
  - 2.3.5 Stems
  - 2.3.6 Stem Guides
  - 2.3.7 Asphalt and Sand
- 2.4 OPERATING HOISTS
  - 2.4.1 Hoists
  - 2.4.2 Position Indicators
  - 2.4.3 Stem Covers
  - 2.4.4 Bolts and Nuts
- 2.5 PORTABLE OPERATOR
  - 2.5.1 Electric Motor Operated Drill
    - 2.5.1.1 Torque Limiter Coupling
    - 2.5.1.2 Adapter Sockets
- 2.6 ELECTRIC MOTOR ACTUATOR (OPERATOR)
  - 2.6.1 Gearing
  - 2.6.2 Bearings
  - 2.6.3 Lubrication
  - 2.6.4 Handwheel
  - 2.6.5 Motors
  - 2.6.6 Limit Switches
  - 2.6.7 Torque Switches
  - 2.6.8 Electric Control Enclosure

2.6.9 Controls

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Instructions

3.1.2 Gate Vendor's Erecting Engineer

3.1.3 Assembly

3.2 TESTS

3.2.1 Testing

3.3 PAINTING

3.3.1 Paint Schedule

3.4 TOOLS

3.5 QUALITY CONTROL

-- End of Section Table of Contents --

SECTION 15050

SLUICE GATES AND OPERATORS

PART 1 GENERAL

1.1 SCOPE

This section includes the sluice gates, portable operators, and accessories to be furnished and installed as shown on the drawings and specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

|             |  |
|-------------|--|
| AASHTO M 29 | (1988) Fine Aggregate for Bituminous Paving Mixtures   |
| AASHTO M 82 | (1975; Rev 1996) Cut-Back Asphalt (Medium Curing Type) |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |  |
|-------------|--|
| ASTM A 36   | (1997e1) Carbon Structural Steel                                   |
| ASTM A 108  | (1999) Steel Bars, Carbon, Cold Finished, Standard Quality         |
| ASTM A 126  | (1995e1) Gray Iron Castings for Valves, Flanges, and Pipe Fittings |
| ASTM A 148  | (1990) Steel Castings, High-Strength, for Structural Purposes      |
| ASTM A 276  | (1998b) Stainless Steel Bars and Shapes                            |
| ASTM A 582  | (1995b) Free-Matching Stainless Steel Bars                         |
| ASTM B 21   | (1996) Naval Brass Rod, Bar, and Shapes                            |
| ASTM B 98   | (1998) Copper-Silicon Alloy Rod, Bar, and Shapes                   |
| ASTM B 584  | (1998a) Copper Alloy Sand Castings for General Applications        |
| ASTM C 33   | (1999ael) Concrete Aggregates                                      |
| ASTM D 2000 | (1999) Rubber Products in Automotive                               |

Applications

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B5.10 (1994) Machine Tapers

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C 501 (1992) Standard for Sluice Gate

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Hoist Design Criteria; GA

Design computations and technical data showing factors of safety, calculations of stresses, and other information necessary to assure compliance with the drawings and specifications shall be submitted to the Contracting Officer.

The Contractor shall submit calculations which clearly show how the size of the operator was chosen. For the sluice gate lifts, a friction factor of 0.6 shall be used, and the gate size and the heads shall be those specified below. Alternate friction factors may be used providing Contractor submits sufficient documentation and calculations.

Gate Vendors Erecting Engineer; FIO

Gate vendor information as specified in paragraph GATE VENDORS ERECTING ENGINEER shall be submitted.

SD-04 Drawings

Sluice Gates; GA  
Operators; GA

Shop drawings shall be submitted for sluice gates and operators showing details for mounting, materials, construction and installation procedures. Catalog data, including specifications and full descriptive data, shall be submitted for all materials and equipment furnished. Other shop drawings to be submitted include the following catalogue and performance data on the portable operator.

SD-19 Operation and Maintenance Manuals

Sluice Gates; GA  
Operators; GA

The Contractor shall submit, prior to delivery of gates to the project work site, five copies of a manual containing complete information in connection with the operation, lubrication, adjustment, routine and special maintenance, disassembly, repair, and reassembly of the gates and accessories. Each set shall be permanently bound and shall have on the

cover the following: (1) The words, "OPERATING AND MAINTENANCE INSTRUCTIONS", (2) the name and location of the project, (3) the Contractor's name, and (4) the contract number. Flysheets shall be placed before instructions covering the subject. The sheets shall be approximately 8-1/2 x 11" which large sheets of drawings folded in. Each set shall include, but not be limited to, the following:

- a. Operating and maintenance instructions for each piece of equipment including lubrication instructions.
- b. Manufacturer's bulletins, cuts, and descriptive data.
- c. Parts lists and recommended spare parts.

## PART 2 PRODUCTS

### 2.1 GENERAL REQUIREMENTS

Sluice gates shall be the standard product of a reputable manufacturer having had at least 5 years of successful experience in the design and manufacture of sluice gates of the size and operating head specified. Gates and accessories shall be of the following design:

- a. Sluice gates shall be rising stem.
- b. Gates shall be flush bottom type, wall mounted as indicated on the drawings.
- c. Sluice gate frames shall be flange back type.
- d. Thimbles shall be sufficiently rigid to preclude distortion during installation.

#### 2.1.1 General Design

Component parts shall be designed for the seating and unseating heads shown in TABLE 1 using a minimum factor of safety of 5, to be increased as desired and be sized and guided so that, unless otherwise shown on the drawings, the slenderness ratio ( $L/R$ ) shall not exceed 200. The opening and closing forces for design of the stem and stem block anchorage shall include friction load based on the operating pressure shown in TABLE 1, with coefficient of friction of not less than 0.6 for sluice gates in addition to the weight of the gate and stem. Stem design shall include a factor of safety of 5 against failure in addition to the column buckling strength reduction effects as given by the Euler formula.

TABLE 1. GATE REQUIREMENTS

| Pump Station | Gate Location                        | No. of Gates | Gate Size Diameter (in) | Seat Pressure (ft) | Unseated Pressure (ft) | Hoisting Method |
|--------------|--------------------------------------|--------------|-------------------------|--------------------|------------------------|-----------------|
| C1           | Pump Station inlet sluice gate       | 1            | 96                      | 21                 | 21                     | P               |
|              | Discharge chamber inlet closure gate | 1            | 108                     | 36                 | 27                     | E               |
| D3           | Pump Station inlet sluice gate       | 2            | 78                      | 15                 | 15                     | P               |
|              | Discharge chamber inlet closure gate | 2            | 108                     | 42                 | 20                     | E               |
| E1           | Pump Station inlet sluice gate       | 1            | 60                      | 17                 | 17                     | P               |
|              | Discharge chamber inlet closure gate | 1            | 108                     | 35                 | 20                     | E               |
| F1           | Discharge chamber inlet closure gate | 1            | 48                      | 27                 | 16                     | E               |

E = Electric motor-operated floor stand (one for each gate)

P = Portable operator (1 electrically operated, portable, tripod-mounted operator for entire project)

## 2.2 MATERIALS

Materials shall meet the requirements of the following referenced publications. Use of other grades or alloys shall be requested in writing and will be subject to approval.

### 2.2.1 Structural Steel

ASTM A 36.

### 2.2.2 Naval Brass

ASTM B 21, copper alloy No. 464 or 482; temper, optional.

a. Iron castings - ASTM A 126.

b. Steel castings - ASTM A 148.

### 2.2.3 Manganese Bronze

ASTM B 584, high-strength yellow brass, copper alloy No. 932.

### 2.2.4 Cold Rolled Steel

ASTM A 108, Grades 1010 through 1020.

### 2.2.5 Stainless Steel



- a. ASTM A 276, Type 304, Condition A (annealed) or B (cold worked, high tensile), type of finish optional.
- b. ASTM A 582, Type 303, Condition A (annealed), type of finish optional.

#### 2.2.6 Bolting Materials

- a. Bolts - ASTM A 582, Type 303 or 416.
- b. Nuts - ASTM B 98, Alloy 655.

#### 2.2.7 Asphalt Liquid

AASHTO M 82, medium core liquid asphalt type, Grade MC-30 or MC-70.

#### 2.2.8 Sand

AASHTO M 29.

#### 2.2.9 Seals

ASTM D 2000, Grade 4AA 625A13.

### 2.3 SLUICE GATES

#### 2.3.1 General

Gates shall be heavy duty type as manufactured by Whipps, Rodney Hunt, Hydro Gate, Waterman, or equal. The sluice gate installations shall be furnished complete with frames, leaves, stems, adjustable stem guides, and anchor bolts, complete and operable in all respects as described herein and as indicated on the drawings. The gates shall be of the pressure seating type, and shall be designed for the seated pressures and unseated pressures indicated in TABLE 1. Gates that have either a seated or unseated design pressure greater than 30 feet shall be of cast iron construction. Gates that have both seated and unseated design pressures less than 30 feet may be of cast iron or stainless steel. The capacities of the operating stands shall be based upon the pressure exerted on the entire area enclosed by the gate sealing surfaces (seating faces). As used herein, operating pressure head is defined as the distance from the center of the slide, in its closed position, to the maximum water surface elevation. Sluice gates designated for power operation shall be sufficiently rugged to withstand operation by means of electric lifts or portable operators.

#### 2.3.2 Wall Thimbles

Wall thimbles shall be of the F type. The thimbles shall be of cast iron or stainless steel with the front flange machined to a plane to provide a true seating surface for the sluice gate frame. Holes shall be drilled and tapped in the thimble to match the mounting hole pattern of the sluice gate frame. The gate frames shall be attached to the thimble by studs. The wall thimble shall be internally braced during concrete placement. Thimble shall be plumb in both planes with +1/16 inch.

#### 2.3.3 Frames

The frames shall be cast iron or stainless steel of ample section to

prevent distortion. Seat facings shall be naval brass or stainless steel and shall be machined to a smooth finish for making a tight seal meeting the requirements of AWWA C 501. The frame guides shall be of cast iron or stainless steel. The frame guides shall be equipped with adjustable side wedges, and the guides shall be of sufficient length so that not less than one-half of the gate is within the guides when the gate is wide open. The side wedges shall be faced with manganese bronze or stainless steel. Wedges shall be designed in such a manner that wedge fastening bolts may be replaced without the removal of the gate frame from the masonry or other setting, and their attachments adequate to resist tight closures of the gates. Gates shall be provided with top wedges.

#### 2.3.4 Gate Leaves

Gate leaves shall be of cast iron or stainless steel, consisting of flat castings with horizontal and vertical ribs of ample section to withstand all of the specified conditions of operation with limited distortion to prevent leakage. The seating surfaces shall be of naval brass or stainless steel not less than 3/4 inch wide and shall be machined to a 63 micro-inch finish or better and attached by dovetail notching to make a watertight seal. The gate shall be guided in the frame with a tongue and groove construction. The tongue and grooves shall be machined full length with a 1/8 inch overall clearance in the frame guide groove. Slide wedges shall be faced with manganese bronze or stainless steel and mounted and secured to prevent rotation that would interfere with their proper action or cause the gate to bind, in addition to meeting the requirements of AWWA C 501.

#### 2.3.5 Stems

The stems shall be of stainless steel conforming to ASTM A 276, Type 302, 303, 304 with a 63 micro-inch finish if machine cut or 32 micro-inch if rolled threads, and shall be of the sizes recommended by the manufacturer. No detectable flaws or surface imperfections will be permitted. The stems shall be provided with thrust nuts of corrosion-resisting metal and shall have adjustable stop nuts to limit the upward and downward travel of the stems. The stems shall be of a size to withstand the axial compressive and tensile forces created during gate operation under the specified unbalanced heads and to transmit in compression at least two times the rated output of the lift with a 25 pound effort on the crank or handwheel. Threads on stems shall be machine cut or rolled with single or double lead threads of the Acme type. The exterior corners of the threads shall be given slight radius of approximately 0.015 inch in order to prevent them from acting as cutting edges as the stem passes through the left nut.

#### 2.3.6 Stem Guides

Stem guides shall be a manufacturer's standard product, except as specified provided herein, and shall be adjustable in two directions to provide full adjustment for proper alignment of the stem. The stem bearing, in the stem guides, shall be brass or bronze brushed. The guides shall be anchored in an approved manner with not less than two bolts.

#### 2.3.7 Asphalt and Sand

Asphalt and sand fill mixture shall be a relatively stiff mix of road asphalt and clean sand. The mixture shall be well tamped so as to have full contact with the embedded frame, and so as to provide a firm fill in the recess.

## 2.4 OPERATING HOISTS

### 2.4.1 Hoists

Sluice gates at the gatewell shall be provided with a manual hoisting unit.

Manual hoisting unit shall be designed to operate in conjunction with portable operators as specified below. Floor stands for the electric actuator shall be designed specifically for this purpose. Manual hoisting units shall be of the hand crank operated, enclosed, pedestal type, equipped with machine cut gears, having gear ratios recommended by the hoist manufacturer. The hoisting units shall be made of cast iron or cast steel. Exposed fastening of 1-1/2 inch diameter and less shall have American Standard hexagon-socket (Allen) type wrench heads. The hoist shall have a cast bronze lift nut, threaded to match and engage with the stem threads. The lift nut shall be provided with ball or roller bearings both above and below a flange on the lift nut, to accommodate the opening and closing thrusts. Each hoist shall be provided with an integral position indicator. A brass plate shall be attached to the lift housing to show counter reading with gate in fully closed position. Each hoist shall be designed to unseat the slide from its wedging device at the maximum head with a maximum force of 40 pounds at 15 inch radius. Means for lubrication of the hoist shall be provided. No more than 16 turns of the hand crank or handwheel shall be required to move the gate 1 inch. A removable, cast-iron crank with a rotating brass grip and a radius of 15 inch shall be provided. All hoists shall be capable of being driven by the same portable operator.

### 2.4.2 Position Indicators

Weathertight and dust-tight stem position indicators shall be provided for all gate stands. The indicators shall be of the dial or counter type, mounted in a cast housing on top of the lift, and with the face of the counter showing through a recessed window in the housing and easily read from the crank location.

### 2.4.3 Stem Covers

Weathertight and dust-tight stem covers shall be provided to enclose and protect the threaded portion of the gate stem. Slotted galvanized steel stem covers shall be provided. The top of the stem shall be visible through the slot throughout its distance of travel during opening and closing operations. The slot shall be covered with a vandal resistant clear plastic material as recommended by the stem manufacturer and as approved. The above plastic material shall be installed as recommended by the stem manufacturer.

### 2.4.4 Bolts and Nuts

All anchor bolts for the rising stem type sluice gate frames and guides, stem guides, hoists and floor stands, and all bolts and studs used in the sluice gate leaves, frames and guides, and stem guides shall be stainless steel conforming to the requirements of ASTM A 276, type 304.

## 2.5 PORTABLE OPERATOR

One power operating device shall be provided for opening and closing of pump station sluice gates. The operator shall be portable, heavy duty drill type, mounted on a tripod.

#### 2.5.1 Electric Motor Operated Drill

The operator shall be portable and capable of opening and closing the gates at the speed and torque specified. The drill shall be reversing type. The dimensions of the coupling for connecting the drill to the gates shall be determined by the Contractor after gate selection. The wrench shall be designed for outdoor service and operate on 120 volt, single phase, 60 hz service. The drill shall be capable of providing a minimum of 30 foot-pounds of torque for continuous duty while operating at a speed of not less than 140 RPM. The drill shall develop a stall torque of 75 foot-pounds. Fifty feet of three conductor, heavy duty cable, shall be provided with the drill for use as an extension cord. The cable shall be complete with a 3 pole plug. An operating stand shall be provided with the drill. The operating stand shall be designed to withstand the stall torque of the drill.

##### 2.5.1.1 Torque Limiter Coupling

A detachable overload release type torque limiting device shall be furnished so as to cause the drill to turn free if the output torque exceeds 50 foot pounds. Resetting shall be accomplished simply by allowing the drill to stop and reversing the rotational direction. The torque coupling shall be manufactured and designed to be torsionally rigid and allow for angular misalignment similar to Model 405 as manufactured by American Autogard Corporation, Rockford, Illinois. The torque limiter coupling shall be factory set and equipped with tamper proof shield and dust and wash-down resistant cover. The input side of the coupling shall be equipped with an adapter shaft. The adapter shaft shall be tool steel with a minimum impact energy rating of 150 percent of the torque limit. The adapter shaft shall be of the diameter, as recommended by the coupling manufacturer and approved by the Contracting Officer and shall be set screwed and keyed to coupling. The other end of the adapter shaft shall be a No.3 external Morse Taper in accordance with ANSI B5.10 and shall properly mate with the approved power drill.

##### 2.5.1.2 Adapter Sockets

The Contractor shall provide adapter sockets of each size and type necessary to connect the torque coupling of the power drill to each of the handwheel shafts of the approved sluice gate actuators. The coupling side of all the adapter sockets shall be shaft mounted of the diameter, set screwed and keyed as recommended by the coupling manufacturer and approved by the Contracting Officer. The handwheel side of the adapter sockets shall be determined by the Contractor and individually configured to mate with the handwheel shafts of each approved permanently mounted actuators. The adapter sockets shall be tool steel with a minimum impact energy rating of 150 percent of the output torque of the portable actuator.

#### 2.6 ELECTRIC MOTOR ACTUATOR (OPERATOR)

Electric motor actuators shall be provided for all discharge chamber sluice gates in the project. The actuator shall include as an integral unit the electric motor, gearing, drive coupling, torque switches, position limit switches, gear case, and a manual operator. The actuator shall be self-locking. Actuator shall be designed to provide 1 foot per minute of gate travel.

##### 2.6.1 Gearing

Gears shall be spur, helical, bevel, and/or worm gears. All gearing shall be heat treated alloy steel.

#### 2.6.2 Bearings

All gears and shafting shall be supported by bearings. Bearings shall be tapered roller bearings.

#### 2.6.3 Lubrication

All gearing and bearings shall be oil lubricated. Seals shall be provided at all shaft penetrations of the gear case. Lubricant shall be suitable for ambient temperatures from -30 degrees F to 100 degrees F.

#### 2.6.4 Handwheel

The operation of the motor shall not cause the handwheel to rotate and the operation of the motor shall not cause the motor to rotate. The handwheel shall have an arrow and the words "OPEN" or "CLOSE" indicating the direction of rotation.

#### 2.6.5 Motors

Electric motors shall be specifically designed for sluice gate actuator service. Motors shall be 480 volt, 3-phase, 1800 rpm maximum. Motors shall be NEMA 4, watertight, construction. Motors shall be capable of operating through one complete cycle "open-close-open" or "close-open-close" without overheating. Motors shall have thermal overload protection.

#### 2.6.6 Limit Switches

Open and close limit switches shall be geared to the drive mechanism and in step at all times whether the unit is operated electrically or manually. Switches shall be field adjustable type.

#### 2.6.7 Torque Switches

Actuator shall include adjustable torque switch to break the control power circuit when the gate reaches the fully open or close position or when the gate hits an obstruction. Open and close torque switches shall be adjustable by means of individually calibrated dials marked "Open" and "Close".

#### 2.6.8 Electric Control Enclosure

Terminal strips, space heater, limit switches, and torque switches shall be housed in an integral compartment to the actuator. Enclosure shall be NEMA 4, watertight, cast aluminum construction. All hardware shall be stainless steel. Motorized gate operators shall include a separate 120 volt source for space heaters. This will limit vandalism by permitting the power to be turned off to the motor controls, without disabling the space heaters. Each operator shall include a disconnect switch on the base of each pedestal. The disconnect switch shall include an auxiliary power contact to open the 120 volt space heater when the disconnect is opened.

#### 2.6.9 Controls

Controls shall include reversing starter, local disconnect, control power transformer, open-stop-close pushbuttons, and position indicating lights.

Control panel/station shall be cast aluminum.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Instructions

The setting, installation, assembly, lubrication, and testing of the gates and hoisting units shall be in accordance with the instructions of the gate manufacturer as approved by the Contracting Officer. These instructions shall be submitted for approval prior to any gate installation work. An erecting engineer shall inspect and determine the adherence to the above instructions for the setting of the gate thimble, rail assemblies, the stem guide anchor bolts, and the hoisting unit anchor bolts; the alignment and assembly of the stem to the sluice gate, stem guides, and hoisting unit; and observe the initial gate operations using the hoist. The Contractor shall make all arrangements for the presence of the erecting engineer for this inspection. The presence of the erecting engineer, however, will not relieve the Contractor of full responsibility.

Wall thimbles and anchor bolts shall be set in place prior to the placing of concrete. Each unit shall be accurately aligned and, if upon completion of the work there is any misalignment or other defective workmanship which is likely to impede the operation of the gate, the necessary corrections shall be made by the Contractor at no additional expense to the Government.

The bottom frame member of flush bottom sluice gates shall be embedded in an asphalt mixture as shown.

Asphalt and sand fill mixture shall be a relatively stiff mix of road asphalt and clean sand. The asphalt material shall be Asphalt Cement (AC), Penetration Grade 120/150. The asphalt content shall not be less than 7 percent of the mix. The sand shall conform to the quality and gradation of fine aggregate for concrete as specified in ASTM C 33. The mixture shall be well tamped so as to have full contact with the embedded frame and to provide a firm fill in the recess.

##### 3.1.2 Gate Vendor's Erecting Engineer

This erecting engineer shall be experienced in the specific installation of sluice gates as a complete system. Installation experience shall include as a minimum three successful installations of which at least one must have been in the last two years and at least one must have been a gate of the larger size furnished with this project. The Gate Vendor shall coordinate with the Contractor on the most advantageous times and durations necessary for his erecting engineer to be at construction site and be confident of the proper installation and operational function of their product. The Vendor's erecting engineer shall initiate instructions for all actions necessary for the proper receipt, inspections, handling, assembly, installation, operation, and testing of this sluice gate system furnished by his company under this contract. Discrepancies shall be reported to the Contracting Officer. The Vendor's erecting engineer shall also keep records of measurements and actions taken during his visits and shall furnish a copy to the Contracting Officer on request or at the completion of each visit. Multiple visits may be required depending on installation sequencing. One of the visits shall be during final preparation and performance of the installed acceptance test. The erecting engineer shall instruct the Contractor in the operation and maintenance features of his company's installed sluice gate product. The following information will be

submitted with the submittal package to verify the qualifications of the engineer:

- a. Experience, years of service, etc., as an erecting engineer.
- b. List of successful gate installations with owner's address and phone number.
- c. Size and type control of the installed gates.

### 3.1.3 Assembly

Prior to assembly, the gate stems shall be thoroughly cleaned, for inspection by the Contracting Officer or his representative. All parts of the gates and operating mechanisms shall be installed and fitted together so that after final assembly there will be no interference through bad alignment, or any warping or twisting of the members that would in any way interfere with operation. All finished contact or bearing surfaces shall be true and exact to insure full and complete contact. All bolts for attaching the gate frames, stem guides, and operating hoists shall be accurately embedded at the time of placing concrete. Provisions for lubrication of the operating mechanisms shall be made and the lubrication systems shall be properly filled with suitable lubricant as recommended by the manufacturer of the hoists. When the sluice gate slide is in the fully closed position and wedged in position against the frame, maximum clearance between mating faces shall not exceed 0.004 inch.

### 3.2 TESTS

After final assembly, each gate shall be tested in the presence of the gate vendor's erecting engineer and the Contracting Officer or his representative by raising and lowering it throughout its complete travel by means of its operating mechanism and to demonstrate that it complies with the specifications. Any defective part or error in the construction or alignment of the complete gate discovered during the tests and trials shall be immediately corrected by the Contractor without cost to the Government.

Upon completion of the installation, each gate shall be lubricated and operated through as many cycles of opening and closing as may be necessary to demonstrate proper functioning of the gates and that the units are free from binding or other defects.

#### 3.2.1 Testing

The portable operator shall be tested in the presence of the Contracting Officer in raising and lowering the gates.

### 3.3 PAINTING

The gate manufacturer shall be responsible for shop prime and finish painting of all cast iron sluice gates and appurtenances supplied under this contract. Painting stainless steel gates is not required. All coatings shall conform with VOC Emission Regulations in effect at the manufacturing location and at project site to allow touch-up or recoating to be performed with the same products. The type of paint shall be as specified in the following schedule. Where required by application the coating shall be approved for contact with drinking water by the NSF, EPA, or other appropriate governing agencies. Number of coats, mil thickness and surface preparation shall be in accordance with the paint

manufacturer's recommendations for that application, but in no case shall be less than the requirements in the following schedule. All coatings shall be free of carcinogens as listed on the IARC monographs. Colors are to be manufacturer's standards, provided they are selected for ease of touch- up and color match and are fade resistant. Colors shall be selected to provide contrast between the product and the prime coat, and between the prime coat and the finish coat, to insure uniform covering and coating thickness. All coatings shall be applied in accordance with the paint manufacturer's recommendations for thinning, technique and safety precautions.

### 3.3.1 Paint Schedule

| <u>Applicatio</u>       | <u>Materia</u> | <u>Preparatio</u> | <u>1st Coa</u>  | <u>2nd Coa</u>  | <u>3rd Coat</u> |
|-------------------------|----------------|-------------------|---|---|-----------------|
| Gates,<br>wall thimbles | Cast Iron      | SP 6              | Amine Mod.<br>Pol. Epoxy<br>Amerlock 400<br>or Equal 5<br>mils min. | Amine Mod.<br>Pol. Epoxy<br>Amerlock 400<br>or Equal 5<br>mils min. | None            |

### 3.4 TOOLS

One set of wrenches and special tools required for the operation and maintenance of the sluice gates installed under this contract shall be furnished at the time of the trial operation.

### 3.5 QUALITY CONTROL

The Contractor shall establish and maintain quality control for work under this section to assure compliance with contract requirements and maintain records of his quality control for all construction operations including, but not limited to, the following:

- a. Materials and workmanship.
- b. Installation.
- c. Trial operations of each gate.
- d. Adjustment.

A copy of the records of inspections and tests, as well as the records of corrective action taken, shall be furnished to the Government as directed by the Contracting Officer.

-- End of Section --



SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15060

PUMP DISCHARGE PIPELINES AND FLAP VALVES

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SYSTEM DESCRIPTION
  - 1.2.1 Design Requirements
  - 1.2.2 Performance Requirements
    - 1.2.2.1 Buried Piping Systems
    - 1.2.2.2 Above Grade Piping Systems
- 1.3 SUBMITTALS
- 1.4 QUALIFICATIONS
  - 1.4.1 Contractor
- 1.5 GENERAL JOB REQUIREMENTS
  - 1.5.1 Components
  - 1.5.2 Standard Products
  - 1.5.3 Identification
- 1.6 DELIVERY, STORAGE AND HANDLING
- 1.7 PROJECT/SITE CONDITIONS
  - 1.7.1 Verification of Dimensions
- 1.8 SEQUENCING AND SCHEDULING

PART 2 PRODUCTS

- 2.1 DUCTILE IRON PIPING SYSTEM
  - 2.1.1 Ductile Iron Pipe
  - 2.1.2 Ductile Iron Joints
    - 2.1.2.1 Restrained Joints
  - 2.1.3 Ductile Iron Fittings
  - 2.1.4 Corrosion Control
- 2.2 ISOLATION JOINTS AND COUPLINGS
  - 2.2.1 Isolation Joints
  - 2.2.2 Metallic Piping Couplings
- 2.3 PIPE SUPPORTS AND PENETRATIONS
  - 2.3.1 Pipe Supports
    - 2.3.1.1 Beam Clamps
    - 2.3.1.2 Riser Clamps
    - 2.3.1.3 Brackets
    - 2.3.1.4 Offset Pipe Clamp
    - 2.3.1.5 Hangers
    - 2.3.1.6 Hanger Rods
  - 2.3.2 Pipe Guides
    - 2.3.2.1 Intermediate Guides
    - 2.3.2.2 Alignment Guides
  - 2.3.3 Flashing Sleeves
  - 2.3.4 Wall Penetrations
    - 2.3.4.1 Above Grade Wall Penetrations
    - 2.3.4.2 Below Grade Wall Penetrations

- 2.4 FLAP VALVES
  - 2.4.1 Materials

PART 3 EXECUTION

- 3.1 PREPARATION
  - 3.1.1 Protection
  - 3.1.2 System Preparation
    - 3.1.2.1 Pipe and Fittings
    - 3.1.2.2 Damaged Coatings
    - 3.1.2.3 Field Fabrication
- 3.2 EXPOSED PIPING INSTALLATION
  - 3.2.1 Anchors and Fasteners
  - 3.2.2 Pipe Flanges
- 3.3 BURIED PIPE PLACEMENT
  - 3.3.1 Excavation and Backfilling
  - 3.3.2 Fittings
  - 3.3.3 Restrained Joints
  - 3.3.4 Marking Tape
- 3.4 CONNECTING DISSIMILAR PIPE
- 3.5 EXTERNAL CORROSION PROTECTION
  - 3.5.1 Underground Metallic Piping
  - 3.5.2 Above Grade Metallic Piping
    - 3.5.2.1 Ferrous Piping
- 3.6 FLEXIBLE JOINTS AT CONCRETE STRUCTURES
- 3.7 PENETRATIONS
- 3.8 PIPING SUPPORT SYSTEMS INSTALLATION
  - 3.8.1 General Support Requirements
  - 3.8.2 Dielectric Barriers
- 3.9 FIELD QUALITY CONTROL
  - 3.9.1 Piping
    - 3.9.1.1 Buried Piping
    - 3.9.1.2 Exposed Piping
    - 3.9.1.3 Time for Making Test
- 3.10 FINAL CLEANING
  - 3.10.1 Interim Cleaning
  - 3.10.2 Flushing
- 3.11 WASTE WATER DISPOSAL

-- End of Section Table of Contents --

SECTION 15060

PUMP DISCHARGE PIPELINES AND FLAP VALVES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |   |
|-------------------|---|
| ASTM A 36/A 36M   | (1997a) Carbon Structural Steel   |
| ASTM A 126        | (1995e) Gray Iron Castings for Valves, Flanges, and Pipe Fittings   |
| ASTM A 167        | (1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip                               |
| ASTM A 181/A 181M | (1995b) Carbon Steel Forgings, for General-Purpose Piping   |
| ASTM A 307        | (1997) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength  |
| ASTM B 21         | (1996) Naval Brass Rod, Bar, and Shapes   |
| ASTM B 98         | (1998) Copper-Silicon Alloy Rod, Bar, and Shapes  |
| ASTM D 1248       | (1998) Polyethylene Plastics Molding and Extrusion Materials  |
| ASTM D 3892       | (1993) Packaging/Packing of Plastics  |
| ASTM E 814        | (1997) Fire Tests of Through-Penetration Fire Stops   |
| ASTM F 402        | (1993) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings |

ASME INTERNATIONAL (ASME)

|            |  |
|------------|--|
| ASME B16.1 | (1989) Cast Iron Pipe Flanges and Flanged Fittings |
| ASME B31.1 | (1998) Power Piping                                |
| ASME B31.3 | (1999) Process Piping                              |

AMERICAN WATER WORKS ASSOCIATION (AWWA)

|           |  |
|-----------|--|
| AWWA C104 | (1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water   |
| AWWA C105 | (1993) Polyethylene Encasement for Ductile-Iron Pipe Systems   |
| AWWA C110 | (1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids  |
| AWWA C111 | (1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings  |
| AWWA C115 | (1996) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges   |
| AWWA C116 | (1998) Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service                      |
| AWWA C150 | (1996) Thickness Design of Ductile-Iron Pipe   |
| AWWA C151 | (1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids   |
| AWWA C153 | (1994; Errata Nov 1996) Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm Through 610 mm) and 54 In. Through 64 In. (1,400 mm Through 1,600 mm) for Water Service |

CODE OF FEDERAL REGULATIONS (CFR)

|             |  |
|-------------|--|
| 29 CFR 1910 | Occupational Safety and Health Standards |
|-------------|--|

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

|                        |  |
|------------------------|--|
| DIPRA-Restraint Design | (1997) Thrust Restraint Design for Ductile Iron Pipe |
|------------------------|--|

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

|           |   |
|-----------|---|
| MSS SP-25 | (1998) Standard Marking System for Valves, Fittings, Flanges and Unions |
| MSS SP-58 | (1993) Pipe Hangers and Supports - Materials, Design and Manufacture    |
| MSS SP-69 | (1996) Pipe Hangers and Supports - Selection and Application            |
| MSS SP-89 | (1998) Pipe Hangers and Supports -                                      |

Fabrication and Installation Practices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

|            |  |
|------------|--|
| NFPA 49    | (1994) Hazardous Chemicals Data  |
| NFPA 325-1 | (1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids |
| NFPA 704   | (1996) Identification of the Fire Hazards of Materials for Emergency Response  |

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

|                  |                                  |
|------------------|----------------------------------|
| SSPC SP 6/NACE 3 | (1994) Commercial Blast Cleaning |
|------------------|----------------------------------|

1.2 SYSTEM DESCRIPTION

This specification covers the requirements for above and below grade discharge piping for all pumps in the project, pipe supports, fittings, equipment and accessories located both inside and outside of pump stations.

1.2.1 Design Requirements

Support systems shall be selected and designed within the specified spans and component requirements. The absence of pipe supports and details on the contract drawings does not relieve the Contractor of responsibility for sizing and providing supports throughout facility.

1.2.2 Performance Requirements

The pressure ratings and materials specified represent minimum acceptable standards for piping systems. The piping systems shall be suitable for the services specified and intended. Each piping system shall be coordinated to function as a unit. Flanges, valves, fittings and appurtenances shall have a pressure rating no less than that required for the system in which they are installed.

1.2.2.1 Buried Piping Systems

Piping systems shall be suitable for design conditions, considering the piping both with and without internal pressure. Consideration shall be given to all operating and service conditions both internal and external to the piping systems.

1.2.2.2 Above Grade Piping Systems

Piping systems shall be suitable for design conditions, considering the piping both with and without internal pressure, and installation factors such as insulation, support spans, and ambient temperatures. Consideration shall be given to all operating and service conditions both internal and external to the piping systems.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Qualifications; GA

A statement certifying that the Contractor has the specified experience.

Welders; FIO

The names of all qualified welders, their identifying symbols, and the qualifying procedures for each welder including support data such as test procedures used, standards tested to, etc.

Waste Water Disposal; FIO

The method proposed for disposal of waste water from hydrostatic tests and disinfection, and all required permits, prior to performing hydrostatic tests.

Assistance and Training; FIO

A signed statement certifying that the installation is satisfactory and in accordance with the contract drawings and specifications and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

Delivery, Storage and Handling; FIO

Material safety data sheets.

Materials and Equipment; GA

Manufacturer's descriptive and technical literature for each piping system, including design recommendations; pressure and temperature ratings; dimensions, type, grade and strength of pipe and fittings; thermal characteristics (coefficient of expansion and thermal conductivity); and chemical resistance to each chemical and chemical mixture in the liquid stream.

Installation; FIO

The manufacturer's installation recommendations or instructions for each material or procedure to be utilized, including materials preparation.

Pipe Schedule; FIO

A list of piping systems, pressure ratings and source of supply for each piping system broken out by material, size and application as indicated on the contract drawings. A list of any special tools necessary for each piping system and appurtenances furnished for adjustment, operation, maintenance and disassembly of the system.

Valve Schedule; FIO

A list of valve materials, pressure ratings, source of supply, and reference identification as indicated in the contract

drawings. A list of any special tools necessary for each valve type and appurtenances furnished for adjustment, operation, maintenance and disassembly.

#### SD-04 Drawings

##### Pipe and Equipment; GA

Equipment shop drawings and support system detail drawings showing piping systems and appurtenances, such as restrained joints, valves, local indicators and hangers, including a complete list of equipment and materials. As-built drawings showing pipe anchors and guides, and layout of piping systems relative to other parts of the work including clearances for maintenance and operation. As-built piping and instrumentation diagrams (P&IDs) identifying and labeling equipment, instrumentation, valves, vents, drains, and all other inline devices; if the contract drawings contained P&IDs, the P&IDs found in the contract drawings shall be revised to reflect the constructed process system, as directed by the Contracting Office .

#### 1.4 QUALIFICATIONS

##### 1.4.1 Contractor

Contractor shall have successfully completed at least 3 projects of the same scope and size or larger within the last 6 years. Contractor shall demonstrate specific experience in regard to the system installation to be performed.

#### 1.5 GENERAL JOB REQUIREMENTS

Piping materials and appurtenances shall be as specified and as shown on the drawings, and shall be suitable for the service intended. Piping materials, appurtenances and equipment supplied as part of this contract shall be new and unused except for testing equipment. Components that serve the same function and are the same size shall be identical products of the same manufacturer. The general materials to be used for the piping systems are indicated by service in the Pipe Schedule.

##### 1.5.1 Components

Piping equipment and appurtenances shall be new products of equal material and ratings as the connecting pipe.

##### 1.5.2 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacturing of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Nominal sizes for standardized products shall be used. Pipe, valves, fittings and appurtenances shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

##### 1.5.3 Identification

Each piece of pipe shall bear the ASTM designation and all other markings required for that designation. Valves shall bear a securely attached tag

with the manufacturer's name, valve model number, and valve identification permanently displayed and be marked in accordance with MSS SP-25.

#### 1.6 DELIVERY, STORAGE AND HANDLING

Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants. Proper protection and care of material before, during and after installation is the Contractor's responsibility. Any material found to be damaged shall be replaced at the Contractor's expense. During installation, piping shall be capped to keep out dirt and other foreign matter. A material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) shall accompany each chemical delivered for use in pipe installation. At a minimum, this includes all solvents, solvent cements, glues and other materials that may contain hazardous compounds. Handling shall be in accordance with ASTM F 402. Storage facilities shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325-1. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, ultraviolet (UV) radiation damage, or other damage. Pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendation. Plastic pipe shall be packed, packaged and marked in accordance with ASTM D 3892.

#### 1.7 PROJECT/SITE CONDITIONS

##### 1.7.1 Verification of Dimensions

After becoming familiar with all details of the work, the Contractor shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

#### 1.8 SEQUENCING AND SCHEDULING

For slab, floor, wall, and roof penetrations, the Contractor shall have onsite pertinent wall pipes and sleeves before they are required for placement in concrete forms. The Contractor shall verify and coordinate the size and location of building and structure pipe penetrations before forming and placing concrete.

### PART 2 PRODUCTS

#### 2.1 DUCTILE IRON PIPING SYSTEM

All pump discharge piping located inside the pump stations shall be ductile iron pipe with flanged joints. All pump discharge piping located outside the pump stations shall be ductile iron pipe with restrained mechanical joint fittings.

##### 2.1.1 Ductile Iron Pipe

Ductile iron pipe for pressure service shall have a design and wall thickness conforming to AWWA C150, AWWA C151, and AWWA C115. Ductile iron pipe shall have a standard double thickness cement lining conforming to AWWA C104 standard asphaltic lining.

##### 2.1.2 Ductile Iron Joints

Joints shall have a working pressure rating for liquids equal to the



pressure rating of the connected pipe. restrained joints conforming to AWWA C110 and AWWA C111 and flanged joints conforming to AWWA C110 shall be used. Gaskets, glands, bolts and nuts shall be furnished with restrained joints; bolts and nuts shall be provided with flanged joints; in sufficient quantity for the complete assembly of each joint. Dielectric fittings or isolation joints shall be provided between all dissimilar metals.

#### 2.1.2.1 Restrained Joints

Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of AWWA C151. Push-on joints for such pipe shall be in accordance with AWWA C111. Pipe thickness shall be designed in accordance with AWWA C150 and shall be based on laying conditions and internal pressures as stated in the drawings and specifications.

Restrained joint fittings and the restraining components shall be ductile iron in accordance with applicable requirements of AWWA C110 and/or AWWA C153 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with AWWA C111.

Fittings with fusion bonded coatings shall be supplied in accordance with AWWA C116. Cement mortar lining and seal coating for pipe and fittings, where applicable, shall be in accordance with AWWA C104. Asphaltic outside coating shall be in accordance with AWWA C151 for pipe and AWWA C110 or AWWA C153 for fittings. Allowable joint deflection for restrained joints shall not be less than 3.0 degrees.

#### 2.1.3 Ductile Iron Fittings

Fittings shall be ductile iron AWWA C110 or AWWA C153. Up to 12 inches inclusive, the fittings shall be 150 psig rated. Flanges and flanged fittings shall conform to AWWA C110 ASME B16.1 and shall be rated for 150 psig service. Materials shall be ductile iron. Bolts and nuts shall be carbon steel conforming to ASTM A 307, Grade B for underground piping. Bolts and nuts shall be Type 304 stainless steel for all piping in the wet well. Bolts shall be provided with washers of the same material as the bolts. Gaskets shall be rubber ring full face, maximum 0.125 in thick. All bolts shall be coated with antisieze compound before assembly and fasteners shall be torqued according to supplier's recommendations.

#### 2.1.4 Corrosion Control

All underground ductile iron piping shall be protected from corrosion with polyethylene tubing in accordance with AWWA C105. Polyethylene tubing shall conform to the requirements of ASTM D 1248. The nominal thickness shall be 0.004 inch for high-density cross-laminated polyethylene film. Installation shall be in accordance with AWWA C105.

### 2.2 ISOLATION JOINTS AND COUPLINGS

#### 2.2.1 Isolation Joints

Isolation joints shall be provided between nonthreaded ferrous and nonferrous metallic pipe fittings and valves. Isolation joints shall consist of an isolation gasket of the dielectric type, isolation washers and isolation sleeves for flange bolts. Isolation gaskets shall be full faced with an outside diameter equal to the flange outside diameter. Bolt isolation sleeves shall be full length. Units shall be of a shape to

prevent metal-to-metal contact of dissimilar metallic piping elements.

### 2.2.2 Metallic Piping Couplings

Thrust ties shall be provided where shown on the contract drawings and where required to restrain the force developed by 1.5 times the maximum allowable operating pressures specified. For metallic pipe other than ductile iron, thrust ties shall be attached with fabricated lugs. For ductile iron pipe, thrust ties shall be attached with socket clamps against a grooved joint coupling or flange. For exposed installations, zinc-plated nuts and bolts shall be used. However, high-strength, low-alloy steel, in accordance with AWWA C111, may be substituted for use on cast iron and ductile iron couplings. For buried and submerged installations, TP304 stainless steel bolts and nuts shall be provided. Steel middle rings and followers shall be fusion bonded epoxy-lined and coated in accordance with Section 09900 PAINTING, GENERAL and pressure tested beyond yield point.

## 2.3 PIPE SUPPORTS AND PENETRATIONS

Auxiliary steel shall be provided by the Contractor where the support of piping systems and equipment is required between building structural elements. Light gauge and structural steel shapes shall conform to the requirements of ASTM A 36/A 36M. The Contractor shall have the option to use pre-engineered support systems of electrogalvanized steel products. However, a mixture of support system manufacturers products is not permitted. Where auxiliary steel is indicated as stainless steel, the Contractor shall provide TP304 stainless steel conforming to ASTM A 167, No. 1 Finish.

### 2.3.1 Pipe Supports

Pipe supports shall conform to the requirements of MSS SP-58, MSS SP-69, and MSS SP-89. Where pipe supports contact bare piping or in-line devices, provide supports of compatible material so that neither shall have a deteriorating action on the other.

#### 2.3.1.1 Beam Clamps

For upper attachments on structural steel, the Contractor shall provide beam clamps of ASTM A 36/A 36M carbon steel or ASTM A 181/A 181M forged steel and MSS SP-58 Types 19 through 23, 25 or 27 through 30. Holes drilled in structural steel for hanger support rods will not be permitted. Clamps shall be provided with hardened steel cup-point set screws and lock-nuts for anchoring in place. Clamp size selection shall only be based on the support of the required load.

#### 2.3.1.2 Riser Clamps

Vertical runs of piping shall be supported at each floor, or closer where required, with ASTM A 36/A 36M carbon steel clamps bolted around pipes and attached to the building construction. Copper plated clamps shall be provided for copper tubing support. Two bolt-type clamps designed for installation under insulation shall be used on insulated pipe runs.

#### 2.3.1.3 Brackets

Where piping is run adjacent to walls or steel columns, the Contractor shall provide welded ASTM A 36/A 36M steel brackets, pre-punched with a minimum of two fastener holes.

#### 2.3.1.4 Offset Pipe Clamp

Where pipes are indicated as offset from wall surfaces, a double-leg design two-piece pipe clamp shall be supplied by the Contractor.

#### 2.3.1.5 Hangers

Hangers shall be Type 304 stainless steel. All hangers shall be of a uniform type and material for a given pipe run and application. Coated or plated hangers shall be used to isolate steel hangers from dissimilar metal tube or pipe. Hangers for pipe sizes 2.5 inches or larger shall incorporate a means of vertical adjustment after erection while supporting the load. For piping systems with liquid temperatures up to 122 degrees F the following shall be used: MSS SP-58 Types 1,3 through 12, Types 24 and 26 with overhead support, or Types 35 through 38 with support from below.

#### 2.3.1.6 Hanger Rods

Hanger rods shall be Type 304 stainless steel. The diameter of the rods for piping system support shall conform to ASME B31.1.

### 2.3.2 Pipe Guides

#### 2.3.2.1 Intermediate Guides

For piping 6 inch and smaller, a pipe clamp with an oversize pipe sleeve shall be provided for a minimum 0.16 inch clearance. For piping 8 inch and larger, U-bolts with double nuts that are manufactured for the purpose shall be used to provide a minimum 0.28 inch clearance around pipe. The stock sizes for the U-bolts are as follows: for a 8 inch pipe use a 0.625 inch U-bolt; for a 10 inch pipe, use a 0.75 inch U-bolt; for a 12 inch to 16 inch pipe, use a 0.875 inch U-bolt; and for 18 inch to 30 inch pipes use 1 inch U-bolts.

#### 2.3.2.2 Alignment Guides

For piping, 8 inch and smaller, alignment guides shall be galvanized steel, spider or sleeve type. For piping, 10 inch and larger, alignment guides shall be galvanized steel, roller type guides.

### 2.3.3 Flashing Sleeves

Galvanized steel flashing sleeves shall be installed wherever piping passes through concrete roof structures. Where piping penetrates roofs, 4 lb. lead flashing shall be provided. The flashing shall extend 8 inches from the pipe in all directions, extend up the pipe, and shall be fitted with double-threaded flashing for pipes 3 inches and smaller. Flashing shall turn down inside the pipe for 4 inches and larger pipes.

### 2.3.4 Wall Penetrations

#### 2.3.4.1 Above Grade Wall Penetrations

Piping which passes through fire-rated or smoke-rated walls, floors, or ceilings shall be provided with insulated and encased pipe sleeves. Penetrations through an existing fire or fire barrier wall shall be sealed with a fire stop system that has an "F" rating not less than the required fire resistance rating of the penetrated wall. The fire stopping sealant

for metal piping systems shall be a water based vibration resistant, polysiloxane (also known as silicone) based, nonslumping, premixed sealant with intumescent properties, that is rated for 3 hours pursuant to ASTM E 814 and UL requirements. The fire stopping sealant for plastic and insulated piping systems shall be a polysiloxane (also known as silicone) based, nonslumping, premixed sealant with intumescent properties acrylic based, nonslumping, premixed sealant with intumescent properties, that is vibration and moisture resistant, and is rated for 3 hours pursuant to ASTM E 814 and UL requirements with metal collars. Vented plastic pipe penetrations shall be fitted with galvanized steel collars that have intumescent inlays.

#### 2.3.4.2 Below Grade Wall Penetrations

Below-grade wall penetrations shall be provided with hydrostatic seals designed to seal opening between pipe or conduit and a through-structure opening. The seals shall be modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening.

#### 2.4 FLAP VALVES

Provide flap valves with flange frame and steel anti-locking bar for mounting on ductile iron discharge piping. Provide lubrication fitting for all hinges. Circular opening for gravity flow.

##### 2.4.1 Materials

- a. Frame and cover or flap Cast-iron, ASTM A 126, Class B.
- b. Seats: Bronze, ASTM B 21.
- c. Hinge arms: High strength malleable iron or high tensile bronze.
- d. Hinge pins: Stainless steel, Type 304 or silicon bronze, ASTM B 98.
- e. Anchor bolts: Stainless steel, Type 304.
- f. Bumper: Ductile iron leaf spring attached to the body and extended over the cover to limit cover travel to 90 degrees. Provide rubber pad at contact point.
- g. Size: As indicated on drawings.

#### PART 3 EXECUTION

##### 3.1 PREPARATION

###### 3.1.1 Protection

Pipe and equipment openings shall be closed with caps or plugs during installation. Equipment shall be protected from dirt, water, and chemical or mechanical damage.

###### 3.1.2 System Preparation

###### 3.1.2.1 Pipe and Fittings

Pipe and fittings shall be inspected before exposed piping is installed or

buried piping is lowered into the trench. The Contractor shall clean the ends of pipes thoroughly, remove foreign matter and dirt from inside of pipes, and keep piping clean during and after laying.

#### 3.1.2.2 Damaged Coatings

The Contractor shall repair damaged coating areas in the field with material equal to the original coating, except for damaged glass-lined pipe which shall be promptly removed from the site. The Contractor shall not install damaged piping materials.

#### 3.1.2.3 Field Fabrication

The Contractor shall notify the Contracting Officer at least 2 weeks prior to the field fabrication of pipe or fittings and at least 3 days prior to the start of any surface preparation or coating application work. Fabrication of fittings shall be performed in accordance with the manufacturer's instructions.

### 3.2 EXPOSED PIPING INSTALLATION

Exposed piping shall be run as straight as practical along the alignment shown on the contract drawings and with a minimum of joints. Piping and appurtenances shall be installed in conformance with reviewed shop drawings, manufacturer's instructions and ASME B31.3. Piping shall be installed without springing or forcing the pipe.

#### 3.2.1 Anchors and Fasteners

Impact expansion (hammer and explosive charge drive-type) anchors and fastener systems are not acceptable. Lead shields, plastic or fiber inserts, and drilled-in plastic sleeve/nail drive systems are also not acceptable.

#### 3.2.2 Pipe Flanges

Pipe flanges shall be set level, plumb, and aligned. Flanged fittings shall be installed true and perpendicular to the axis of the pipe. The bolt holes shall be concentric to the centerline of the pipe and shall straddle the vertical centerline of the pipe.

### 3.3 BURIED PIPE PLACEMENT

#### 3.3.1 Excavation and Backfilling

Earthwork shall be performed as specified in Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Backfilling shall be accomplished after inspection by the Contracting Officer. The Contractor shall exercise care when lowering pipe into the trench to prevent damage or twisting of the pipe.

#### 3.3.2 Fittings

At valves and connections, the trench bottom shall be dug out with sufficient length, width, and depth to ensure clearance between the undisturbed trench bottom and the valves and such connections.

#### 3.3.3 Restrained Joints

For ductile iron pipe, restrained joints shall be designed by the Contractor or the pipe manufacturer in accordance with DIPRA-Restraint Design.

#### 3.3.4 Marking Tape

Pipe marking tape shall be provided and installed in accordance with the requirements of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

#### 3.4 CONNECTING DISSIMILAR PIPE

Flexible transition couplings, dielectric fittings and isolation joints shall be installed in accordance with the manufacturer's instructions.

#### 3.5 EXTERNAL CORROSION PROTECTION

Protect all pipe and piping accessories from corrosion and adverse environmental conditions.

##### 3.5.1 Underground Metallic Piping

Buried metallic piping shall be protected from corrosion using polyethylene tubing. Where dissimilar metals are joined underground, gas-tight isolation joints shall be used. Insulating joint material shall be provided where shown to control galvanic or electrical action.

##### 3.5.2 Above Grade Metallic Piping

Nonferrous and stainless steel piping shall not be painted except for aluminum alloy piping. Where dissimilar metals are joined, isolation joints shall be used.

##### 3.5.2.1 Ferrous Piping

Shop primed surfaces shall be touched up with ferrous metal primer. Surfaces that have not been shop primed shall be solvent cleaned. Surfaces that contain loose rust, mill scale or other foreign substances shall be mechanically cleaned by commercial sand blasting conforming to SSPC SP 6/NACE 3 and primed with a ferrous metal primer. Primed surfaces shall be finished with two coats of exterior oil paint in accordance with Section 09900 PAINTING, GENERAL.

#### 3.6 FLEXIBLE JOINTS AT CONCRETE STRUCTURES

Flexible joints shall be provided at the face of all structures, whether or not shown on the contract drawings. Rubber ring joints, restrained joints, flexible couplings, and proprietary restrained ductile iron pipe joints shall be considered flexible joints; welded pipe joints shall not. Joints may be flush with the structure face or may be located up to 1 pipe diameter away from face, but not further than 17.7 inches away from face. For pipelines larger than 18 inches in diameter the first joint shall be within 1 pipe diameter.

#### 3.7 PENETRATIONS

Cast iron wall sleeves shall be provided at all above grade and below grade pipe penetrations. Embedded metallic piping shall be isolated from concrete reinforcement using coated pipe penetrations. Coatings shall be

as specified in Section 09900 PAINTING, GENERAL. Wall pipes shall be securely supported by form work to prevent contact with reinforcing steel and tie-wires. Joints shall be sealed with a wall penetration seal.

### 3.8 PIPING SUPPORT SYSTEMS INSTALLATION

The absence of pipe supports and details on the contract drawings shall not relieve the Contractor of responsibility for sizing and providing supports throughout plant.

#### 3.8.1 General Support Requirements

Pipe support systems shall meet the requirements of MSS SP-58. Contractor-designed and selected support systems shall be installed in accordance with MSS SP-69, and as specified herein. Piping connections to equipment shall be supported by pipe supports and not off the equipment. Large or heavy valves, fittings, and/or equipment shall be supported independently of associated piping. Pipes shall not be supported off other pipes. Supports shall be provided at piping changes in direction or in elevation, adjacent to flexible joints and couplings, and where otherwise shown on the contract drawings. Pipe supports and hangers shall not be installed in equipment access areas or bridge crane runs. Hanging pipes shall be braced against horizontal movement by both longitudinal and lateral sway bracing. At each channel type support, every pipe shall be provided with an intermediate pipe guide, except where pipe anchors are required. Existing support systems may be used to support additional new piping only if the Contractor can demonstrate that the existing support systems are adequate for the additional loads, or if the existing systems are strengthened to support the additional loads. Pedestal type pipe supports shall be provided under base flanges adjacent to rotating equipment and where required to isolate vibration. Piping 2.5 inches in diameter and larger shall be braced for seismic forces. Lateral supports for seismic loads shall be installed at all changes in direction.

#### 3.8.2 Dielectric Barriers

Dielectric barriers shall be installed between supports and copper or stainless steel piping, and between stainless steel supports and non-stainless steel ferrous piping.

### 3.9 FIELD QUALITY CONTROL

#### 3.9.1 Piping

##### 3.9.1.1 Buried Piping

After the pipe is laid, the joints completed and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic test pressure of 1.5 times the design operating pressure. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced as necessary. Defective pipe, joints, fittings, and valves found during the pressure test shall be removed and replaced with new material, and the test repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions are encountered: (1) wet or unstable soil

conditions in the trench; (2) compliance would require maintaining barricades and walkways around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions; or (3) maintaining the trench in an open condition would delay completion of the Contract. The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

#### 3.9.1.2 Exposed Piping

Hydrostatic testing shall be conducted in accordance with ASME B31.3. Piping systems shall be tested under normal service conditions to demonstrate compliance. The test pressure shall not be less than 1.5 times the design pressure. Water shall be used as the hydrostatic test fluid. The Contractor shall provide clean test water of such quality to prevent corrosion of the piping system materials. Air release vents shall be opened at all high points of the piping system in order to purge air pockets while the piping system is filling.

- a. For rigid piping hydrostatic testing, the maximum test pressure shall be calculated according to ASME B31.3, but shall not exceed the yield strength of the piping system. The maximum velocity during filling shall be 0.25 fps applied over full area of pipe in accordance with the manufacturer's instructions. Venting during filling may also be provided by loosening flanges with a minimum of four bolts or by the use of equipment vents. The Contractor shall test all parts of the piping system. The hydrostatic test pressure shall be maintained continuously for 30 minutes minimum and for such additional time as necessary to conduct examinations for leakage. All joints and connections shall be examined by the Contractor for leakage. The piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of leaking. The Contractor shall correct visible leakage and retest. Unless otherwise directed by the Contracting Officer, the piping system shall be left full of water after leaks are repaired.

#### 3.9.1.3 Time for Making Test

Except for joint material setting or where concrete thrust blocks necessitate a delay, underground piping jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Tests for above ground pressure piping shall be conducted after the piping has been completely installed, including all supports, hangers, and anchors, and inspected for proper installation but prior to installation of insulation.

### 3.10 FINAL CLEANING

#### 3.10.1 Interim Cleaning

The Contractor shall prevent the accumulation of weld rod, weld spatter, pipe cuttings and filings, gravel, cleaning rags, and other foreign material within piping sections during fabrication. The piping shall be examined to assure removal of these and other foreign objects prior to assembly and installation.



### 3.10.2 Flushing

Following assembly and testing, and prior to final acceptance, piping systems shall be flushed with water to remove accumulated construction debris and other foreign matter. The piping shall be flushed until all foreign matter is removed from the pipeline. The Contractor shall provide all hoses, temporary pipes, ditches, and other items as required to properly dispose of flushing water without damage to adjacent properties. The minimum flushing velocity shall be 2.5 fps. For large diameter pipe where it is impractical to flush the pipe at the minimum flushing velocity, the pipeline shall be cleaned in-place from the inside by brushing and sweeping, then flushing the pipeline at a lower velocity. Cone strainers shall be installed in the flushing connections of attached equipment and left in place until cleaning is completed. Accumulated debris shall be removed through drains, or by removing spools or valves.

### 3.11 WASTE WATER DISPOSAL

The water used for testing, cleaning, flushing and/or disinfection shall be disposed of in accordance with all applicable regulations. Disposal is solely the responsibility of the Contractor. The method proposed for disposal of waste water shall be provided to, and approved by, the Contracting Officer prior to performing any testing, cleaning, flushing and disinfection activities.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15161

ELECTRICAL PUMP (INSTALLATION)

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 SYSTEM DESCRIPTION AND PERFORMANCE REQUIREMENTS
  - 1.3.1 Operating Conditions
  - 1.3.2 Performance Requirements
- 1.4 SHIPPING AND STORAGE

PART 2 PRODUCTS

- 2.1 GENERAL REQUIREMENTS
  - 2.1.1 Coordination
  - 2.1.2 Nameplates
  - 2.1.3 Instruction Plates
  - 2.1.4 Verification of Dimensions
- 2.2 MATERIALS AND METALWORK FABRICATION
  - 2.2.1 Designated Materials
  - 2.2.2 Bolted Connections
    - 2.2.2.1 Bolts, Nuts, and Washers
    - 2.2.2.2 Materials Not Specifically Described
  - 2.2.3 Flame Cutting of Material
  - 2.2.4 Alignment of Wetted Surfaces
- 2.3 DISCHARGE ELBOW
  - 2.3.1 General
  - 2.3.2 Flanged Joints
  - 2.3.3 Nuts and Bolts
  - 2.3.4 Dissimilar Metals
- 2.4 NAMEPLATE
- 2.5 INSTRUCTION PLATES

PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 CLEANUP PRIOR TO START
- 3.3 PUMP FIELD TESTS
  - 3.3.1 Dry Test
  - 3.3.2 Wet Test
  - 3.3.3 Field Test Report
  - 3.3.4 Pump Removal

-- End of Section Table of Contents --

SECTION 15161

ELECTRICAL PUMP (INSTALLATION)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |   |
|-------------------|---|
| ASTM A 27/A 27M   | (1996) Steel Castings, Carbon, for General Application  |
| ASTM A 36/A 36M   | (1997a) Carbon Structural Steel   |
| ASTM A 48         | (2000) Gray Iron Castings   |
| ASTM A 108        | (1999) Steel Bars, Carbon, Cold Finished, Standard Quality  |
| ASTM A 167        | (1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip                             |
| ASTM A 176        | (1997) Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip                                    |
| ASTM A 242/A 242M | (1998) High-Strength Low-Alloy Structural Steel   |
| ASTM A 276        | (1998b) Stainless Steel Bars and Shapes   |
| ASTM A 297/A 297M | (1997; R 1998) Steel Casting, Iron-Chromium and Iron-Chromium-Nickel, Heat Resistant, for General Application |
| ASTM A 312/A 312M | (1999) Seamless and Welded Austenitic Stainless Steel Pipes   |
| ASTM A 516/A 516M | (1990; R 1996) Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service              |
| ASTM A 576        | (1990b; R 1995) Steel Bars, Carbon, Hot-Wrought, Special Quality  |
| ASTM A 668/A 668M | (1996) Steel Forgings, Carbon and Alloy, for General Industrial Use   |
| ASTM B 148        | (1997) Aluminum-Bronze Sand Castings  |

ASTM B 584 (1998a) Copper Alloy Sand Castings for General Applications

ASTM D 2000 (1999) Rubber Products in Automotive Applications

ASME INTERNATIONAL (ASME)

ASME B46.1 (1995) Surface Texture (Surface Roughness, Waviness, and Lay)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2000) Structural Welding Code - Steel

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C200 (1997) Steel Water Pipe - 6 In. (150 mm) and Larger

AWWA C203 (1997) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied

AWWA C207 (1994) Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)

AWWA C208 (1996) Dimensions for Fabricated Steel Water Pipe Fittings

HYDRAULIC INSTITUTE (HI)

HI 2.1-2.5 (1994) Vertical Pump

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

Installation and Erection Instructions; GA.

The Contractor shall review printed and bound manuals describing the procedures for erecting, assembling, and installing the pumps and controls. These procedures will be followed by a pump installation contractor under the supervision of an erecting engineer. The manuals shall be submitted with any comments or questions at the time the pump shop drawings are reviewed.

The installation description is a complete, orderly, step-by-step explanation of the various operations required to install each type of pump including the guide rails or cables and discharge shoe. It describes all special procedures and outlines special precautions. It includes such things as bolt torque values, permissible wear ring clearances, recommended instrument set-ups,

recommended gages and instruments, bearing clearances, and similar details.

The Description may be complemented and supplemented by Contractor comments, drawings, sketches, photographs, and similar materials as necessary. The overall result shall be a description which may be comprehended by an engineer or mechanic without extensive experience in erecting or installing pumps of the type required.

After review, the Government will furnish to the Contractor a recommended comments and direction as necessary or desirable for the installation procedure and return two copies of the previously reviewed manual back to the Contractor. Differences of opinion between the Contractor, pump manufacturer, and Contracting officer shall be reconciled in a manner mutually agreeable to all parties, and two copies of the reviewed and annotated manual shall be submitted to the Contracting Officer's Representative. The final approved installation instructions shall be followed by the installation personnel for the completion of pump installation work.

#### SD-19 Operation and Maintenance Manuals

##### Operating and Maintenance Manual; GA

The Contractor shall review, prior to installation of any pumps to the project work site, a copy of the manual containing complete information in connection with the operation, lubrication, adjustment, routine and special maintenance, disassembly, repair, and reassembly of the pumps and accessories. The manual may include a listing of special tools required for working on the pumps and controls. The manual shall incorporate complete information of the controls covered under this section and include operation and maintenance procedures, special features, and instructions for setting all adjustable controls and equipment. Comprehensive as-installed drawings, photographs, field test results, and sketches of the pump installations shall be included.

### 1.3 SYSTEM DESCRIPTION AND PERFORMANCE REQUIREMENTS

#### 1.3.1 Operating Conditions

a. The pump shall be capable of operating in the dry (for the purpose of maintenance and operating checks) for short periods of time as stated in the manufacturer's operating instruction.

b. The pump manufacturer shall establish and state in the operating manual the procedures for starting and stopping the pumps, including setting of valves or any sequential operations.

#### 1.3.2 Performance Requirements

a. When operated in the dry, the maximum level of vibration of the assembled pumping unit shall not be greater than the value of the lower limit of the good range of the "General Machinery Vibration Severity Chart". This chart can be obtained from Entek IRD, 1700 Edison Drive, Cincinnati, Ohio 45150. Measurements shall be taken at pump operating speed during the field start-up test.

- b. The pump shall be capable of operating without instability over the required range of head.

#### 1.4 SHIPPING AND STORAGE

The pump will be inspected for damage or other distress when received at the project site. The pump and associated equipment shall be stored indoors as recommended by the pump manufacturer, protected from construction or weather hazards at the project site. The pump and equipment shall have adequate short-term storage in a covered, dry, and ventilated location prior to installation. The manufacturer's instructions shall be followed for extended storage. Proper equipment for handling the pump shall be supplied and shall be considered as special tools if not completely standard.

### PART 2 PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

Submersible storm water pumps and sump pumps in this contract are Government-furnished. Pumps shall be installed at the pumping locations as shown. A total of 13 pumps including 4 at Pump Station C1, 5 pumps at Pump Station D3, and 4 pumps at Pump Station E1, shall be installed. The term "pump" shall mean the assembled pump-motor for unit complete with electrical cable, discharge elbow, and guide rail mounting system, excluding twin guide rails which shall be provided by the Contractor.

##### 2.1.1 Coordination

The Contractor shall install the controls required for the installation contract work. Electrical requirements are given in Section 16415 ELECTRICAL WORK, INTERIOR. All pump shop drawings and control shop drawings shall be coordinated and all electrical and mechanical installation details submitted.

##### 2.1.2 Nameplates

Each major item of equipment has the manufacturer's name, address, type/style, model, serial number, and catalog number on a plate secured to the item of equipment. Nameplates are made of corrosion resisting metal with raised or depressed lettering on a contrasting colored background. The Contractor shall review the nameplate data and report any discrepancies to the Contracting officer.

##### 2.1.3 Instruction Plates

As necessary, each item of equipment has been equipped with suitably installed instruction plates including warning and cautions describing special and important procedures to be followed while starting, operating and servicing the equipment. The plates are made of corrosion resisting metal with raised or depressed lettering on a contrasting colored background.

##### 2.1.4 Verification of Dimensions

The Contractor shall be familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy prior to performing the work.

## 2.2 MATERIALS AND METALWORK FABRICATION

### 2.2.1 Designated Materials

Designated materials shall conform to the following specifications, grades, and classifications.

| MATERIALS  | SPECIFICATION, GRADE, CLASS                         |
|--|---|
| Aluminum-Bronze  | ASTM B 148, Alloy<br>No. C95500 Castings            |
| Cast Iron  | ASTM A 48, Class Nos. 30A,<br>30B, and 30C          |
| Cast Steel   | ASTM A 27/A 27M Grade 65-35, annealed               |
| Coal Tar Protective Coatings                           | AWWA C203   |
| Cold-Rolled Steel Bars                                 | ASTM A 108, min, Wt. Strm 65,000 psi                |
| Copper Alloy Castings                                  | ASTM B 584, Alloy No. C93700                        |
| Corrosion-Resistant Alloy<br>Castings                  | ASTM A 297/A 297M, Grade CA-15, CAGNN<br>and CF-8M  |
| Dimensions for Steel Water<br>Pipe Fittings            | AWWA C208   |
| Hot-Rolled Stainless                                   | ASTM A 576, Graded G10200, G10450,<br>and G11410    |
| Ring Flanges   | AWWA C207, Class B                                  |
| Rubber Products in Automotive<br>Applications          | ASTM D 2000   |
| Seamless and Welded Austenitic<br>Stainless Steel Pipe | ASTM A 312/A 312M                                   |
| Stainless Bars and Shapes                              | ASTM A 276, Grades S30400 and S41000                |
| Steel Forging  | ASTM A 668/A 668M, Class F                          |
| Steel Pipe<br>6 in. and Larger                         | AWWA C200   |
| Steel Plates, Pressure Vessel                          | ASTM A 516/A 516M, Grade 55                         |
| Steel Plate  | ASTM A 242/A 242M                                   |
| Stainless Steel Plate                                  | ASTM A 167, UNS S30400 or<br>ASTM A 176, UNS S40500 |
| Quality Steel  | ASTM A 36/A 36M                                     |
| Surface Texture  | ASME B46.1  |

## 2.2.2 Bolted Connections

### 2.2.2.1 Bolts, Nuts, and Washers

Bolts, nuts, and washers shall conform to requirements herein specified and the paragraphs SUBMERSIBLE PUMP, DISCHARGE TUBE AND DISCHARGE ELBOW, and the subparagraph, NUTS AND BOLTS for types required. Use beveled washers where bearing faces have a slope of more than 1:20 with respect to a plane normal to bolt axis.

### 2.2.2.2 Materials Not Specifically Described

Materials not specifically described shall conform to the latest ASTM specification or to other listed commercial specifications covering class or kinds of materials to be used.

### 2.2.3 Flame Cutting of Material

Flame cutting of material other than steel shall be subject to the approval of the Contracting Officer. Shearing shall be accurately done, and all portions of work neatly finished. Steel may be cut by mechanically guided or hand-guided torches, provided an accurate profile with a smooth surface free from cracks and notches is secured. Surfaces and edges to be welded shall be prepared in accordance with Section 3 of AWS D1.1. Chipping and/or grinding will not be required except where specified and as necessary to remove slag and sharp edges of technically guided or hand-guided cuts not exposed to view. Visible or exposed hand-guided cuts shall be chipped, ground, or machined to metal free of voids, discontinuities, and foreign materials.

### 2.2.4 Alignment of Wetted Surfaces

Exercise care to ensure that the correct alignment of wetted surfaces being joined by a flanged joint is being obtained. Where plates of the water passage change thickness, a transition shall occur on the outer surface, leaving the inner surface properly aligned. When welding has been completed and welds have been cleaned, but prior to stress relieving, joining of plates shall be carefully checked in the presence of a Government inspector for misalignment of adjoining parts.

## 2.3 DISCHARGE ELBOW

### 2.3.1 General

The installation of the discharge elbow shall be in accordance with the pump manufacturer's instructions. For purposes of performance and this specification it shall be treated as part of the pumping unit. The discharge elbow shall be of such size to accommodate the dimensions of the pump supplied in accordance with the manufacturer's requirements. It shall be permanently installed in the pump sump as shown on the drawings. The design shall be such that the pumps will be automatically and firmly connected to the discharge tube when lowered into place and shall be in accordance with the pump manufacturer's instructions. A locking device shall be provided that prohibits rotational movement of the pump within the tube. The pumps shall be easily removable for inspection or service without need to enter the pump sump. The pumps shall not require any bolts, nuts, or fasteners for connection to the discharge housing. Stiffening, guides, or other features shall be provided at the pump support to ensure concentric positioning of the pump in the discharge tube. Means



shall be provided such that an effective seal is obtained between the pump and discharge tube. Power cable penetrations shall be watertight.

#### 2.3.2 Flanged Joints

Design flanged joints to be airtight and watertight, without the use of preformed gaskets, except that the use of a gasketing compound will be permitted. Mating flanges shall be male/female rabbet type or doweled with not less than four tapered dowels equally spaced around the flange. Flanges and drill bolt holes shall be machined concentric with the centerline, having a tolerance of plus or minus 1/4 of the clearance between the bolt and the bolt hole. When fabricated from steel plate, flanges shall not be less than 1 1/2 in. thick after machining. Flange machining shall not vary more than 10 percent of the greatest flange thickness. Fabricated flanges, as a minimum, shall be constructed to the dimensions of AWWA C207, Class B. Flanges shall be connected to the column tube and discharge elbow with two continuous fillet welds, one at the inside diameter of flange-to-pump-tube and the other at the outside diameter of pump-tube-to-flange. Weld design is the pump manufacturer's responsibility. Mating flanges shall be machined parallel to a tolerance of 0.002 in. The machine mating flange surface shall be finished to 125 microns or better.

#### 2.3.3 Nuts and Bolts

Nuts and bolts shall be of the hexagonal type. Bolts, including assembly, anchor, harness, and dowels, shall be 300 stainless steel. Nuts shall be bronze; washers shall be 300 series stainless steel.

#### 2.3.4 Dissimilar Metals

When dissimilar metals are used in intimate contact, suitable protection against galvanic corrosion shall be applied. The anodic member shall be protected by proper electrical insulation of the joint.

#### 2.4 NAMEPLATE

The pumping unit shall be identified by means of a separate nameplate permanently affixed in a conspicuous location. The plate shall bear the manufacturer's name, model designation, serial number if applicable, and other pertinent information such as horsepower, speed, capacity, type, and direction of rotation. The plate shall be made of corrosion-resistant metal with raised or depressed lettering and a contrasting background.

#### 2.5 INSTRUCTION PLATES

The pumping unit shall be equipped with suitably located instruction plates, including any warnings and cautions, describing any special and important procedures to be followed in starting, operating, and servicing the equipment. Plates shall be made of corrosion-resistant metal with raised or depressed lettering and a contrasting background.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Correct installation and assembly of the pumping unit shall be the Contractor's responsibility and shall be in accordance with the drawings and with the manufacturer's installation and erection instructions. The

Contractor shall furnish all bolts, shims, tools, and other devices necessary for installing the pumping units. The manufacturer's representative(s) familiar with the equipment being installed shall supervise the handling, installation, start-up, and testing of the equipment as required in the paragraph INSTALLATION AND START-UP ENGINEER.

### 3.2 CLEANUP PRIOR TO START

After the pumping unit is installed and prior to start-up, complete clean up of the sump area of any accumulated construction debris shall be done. This final cleaning of the sump area will be witnessed by a representative of the Government. Any damage to the pumping units or related equipment during initial start-up due to foreign objects left in the sump areas shall be corrected at the Contractor's expense.

### 3.3 PUMP FIELD TESTS

Field testing shall be conducted by an experienced field test engineer and will be witnessed by the Contracting Officer. Before initially energizing the pump/motors, the Contractor shall have successfully tested all pumping plant control, monitoring, and protective circuits. This thorough electrical checkout procedure shall have followed a detailed step-by-step approved test plan. The motor and other pumping unit elements undergoing tests should also be checked at this time.

#### 3.3.1 Dry Test

Each pumping unit shall be tested in the dry in accordance with the pump manufacturer's instructions to determine whether it has been properly installed. Such tests shall be made when, and as, directed by the Contracting Officer. The pump shall be operated at full rated speed for 2 periods of 2 minutes each, or as otherwise recommended by the pump manufacturer. During the tests, the operation of the pumping units shall be observed carefully and measurement of vibration and motor-bearing temperatures recorded. Vibration limits shall not exceed those recommended by HI 2.1-2.5. Without additional cost to the Government, the Contractor shall make all changes and correct any errors for which the Contractor is responsible.

#### 3.3.2 Wet Test

Each unit shall be given an operating test under load for a period of at least 4 hours or as directed by the Contracting Officer. The tests shall be conducted by the Contractor and will be witnessed by the Government. During the tests, the operation of the pumping units shall be observed carefully and measurement of vibration and motor-bearing temperatures recorded. Vibration limits shall not exceed those recommended by HI 2.1-2.5. Without additional cost to the Government, the Contractor shall make all changes and correct any errors for which the Contractor is responsible. Should there be insufficient water to perform the testing, the Contracting Officer may as an option, waive such testing.

#### 3.3.3 Field Test Report

A test report of the field testing shall be prepared and submitted in accordance with paragraph SUBMITTALS.

#### 3.3.4 Pump Removal

## Grand Forks Phase 2 Levees

The Contractor shall demonstrate the removal and installation procedures of the submersible pump by removing and then reinstalling at least 1 submersible pump and 1 sump pump at each pump station utilizing the electric overhead monorail hoist.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15250

MECHANICAL INSULATION

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL QUALITY CONTROL
  - 1.2.1 Standard Products
  - 1.2.2 Installer's Qualifications
  - 1.2.3 Surface Burning Characteristics
  - 1.2.4 Identification of Materials
- 1.3 SUBMITTALS
- 1.4 STORAGE

PART 2 PRODUCTS

- 2.1 GENERAL MATERIALS
  - 2.1.1 Adhesives
    - 2.1.1.1 Lagging Adhesive
  - 2.1.2 Contact Adhesive
  - 2.1.3 Caulking
  - 2.1.4 Corner Angles
  - 2.1.5 Finishing Cement
  - 2.1.6 Fibrous Glass Cloth and Glass Tape
  - 2.1.7 Staples
  - 2.1.8 Wire
- 2.2 PIPE INSULATION MATERIALS
  - 2.2.1 Aboveground Hot Pipeline
    - 2.2.1.1 Domester Hot Water Piping
  - 2.2.2 Aboveground Cold Pipeline
- 2.3 DUCT INSULATION MATERIALS
  - 2.3.1 Flexible Cellular
- 2.4 EQUIPMENT INSULATION MATERIAL
  - 2.4.1 Water Storage Tank

PART 3 EXECUTION

- 3.1 APPLICATION - GENERAL
  - 3.1.1 Installation
  - 3.1.2 Welding
  - 3.1.3 Pipes/Ducts/Equipment which Require Insulation
- 3.2 PIPE INSULATION INSTALLATION
  - 3.2.1 Pipe Insulation
    - 3.2.1.1 General
    - 3.2.1.2 Pipes Passing Through Walls, Roofs, and Floors
    - 3.2.1.3 Pipes Passing Through Hangers
  - 3.2.2 Aboveground Hot Pipelines
    - 3.2.2.1 Insulation Thickness
    - 3.2.2.2 Jacket for Insulated Hot Pipe, Except Pipe Insulated with

- Flexible Cellular
- 3.2.2.3 Insulation for Straight Runs
- 3.2.2.4 Insulation for Fittings and Accessories
- 3.2.2.5 Insulation for Fittings
- 3.3 DUCT INSULATION INSTALLATION
- 3.3.1 Duct Insulation Thickness
- 3.3.2 Installation on Exposed Duct Work

-- End of Section Table of Contents --

SECTION 15250

MECHANICAL INSULATION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. At the discretion of the Government, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to assure compliance with the standard or standards referenced in this specification.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |  |
|-------------------|--|
| ASTM A 167        | (1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip  |
| ASTM A 580/A 580M | (1998) Stainless Steel Wire  |
| ASTM B 209M       | (1995) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)  |
| ASTM C 449/C 449M | (1995) Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement   |
| ASTM C 518        | (1998) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus |
| ASTM C 533        | (1995) Calcium Silicate Block and Pipe Thermal Insulation  |
| ASTM C 534        | (1999) Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form                              |
| ASTM C 610        | (1995) Molded Expanded Perlite Block and Pipe thermal Insulation   |
| ASTM C 795        | (1998el) Thermal Insulation for Use in Contact With Austenitic Stainless Steel   |
| ASTM C 920        | (1998) Elastomeric Joint Sealants  |
| ASTM C 1136       | (1995) Flexible, Low Permeance Vapor Retarders for Thermal Insulation  |
| ASTM E 84         | (1999) Surface Burning Characteristics of Building Materials   |

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS  
INDUSTRY (MSS)

MSS SP-69 (1996) Pipe Hangers and Supports -  
Selection and Application

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

MICA Insulation Stds (1993) National Commercial & Industrial  
Insulation Standards

1.2 GENERAL QUALITY CONTROL

1.2.1 Standard Products

Materials shall be the standard products of manufacturers regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.2.2 Installer's Qualifications

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

1.2.3 Surface Burning Characteristics

Unless otherwise specified, insulation not covered with a jacket shall have a flame spread index no higher than 75 and a smoke developed index no higher than 150. Flame spread and smoke developed indexes shall be determined by ASTM E 84. Insulation shall be tested in the same density and installed thickness as the material to be used in the actual construction. Material supplied by a manufacturer with a jacket shall be tested as a composite material. Jackets, facings, and adhesives shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with ASTM E 84.

1.2.4 Identification of Materials

Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-14 Samples

Thermal Insulation Materials; GA

A complete list of materials, including manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. The product number, k-value, thickness and furnished accessories for each mechanical system

requiring insulation shall be included. Materials furnished under this section of the specification shall be submitted at one time.

After approval of materials and prior to applying insulation a booklet shall be prepared and submitted for approval. The booklet shall contain marked-up MICA Insulation Std's plates (or detail drawings showing the insulation material and insulating system) for each pipe, duct, or piece of equipment required to be insulated per this specification. The MICA plates shall be marked up showing the materials to be installed in accordance with the requirements of this specification for the specific insulation application. The Contractor shall submit all MICA Plates required to show the entire insulating system, including Plates required to show insulation penetrations, vessel bottom and top heads, legs, and skirt insulation as applicable. If the Contractor elects to submit detailed drawings instead of marked-up MICA Plates, the detail drawings shall show cut-away, section views, and details indicating each component of the insulation system and showing provisions for insulating jacketing, and sealing portions of the equipment. For each type of insulation installation on the drawings, provide a label which identifies each component in the installation (i.e., the duct, insulation, adhesive, vapor retarder, jacketing, tape, mechanical fasteners, etc.) Indicate insulation by type and manufacturer. Three copies of the booklet shall be submitted at the jobsite to the Contracting Officer. One copy of the approved booklet shall remain with the insulation Contractor's display sample and two copies shall be provided for Government use.

After approval of materials actual sections of installed systems properly insulated in accordance with the specification requirements shall be displayed. Such actual sections must remain accessible to inspection throughout the job and will be reviewed from time to time for controlling the quality of the work throughout the construction site. Each material used shall be identified, by indicating on an attached sheet the specification requirement for the material and the material by each manufacturer intended to meet the requirement. Display sample sections will be inspected at the jobsite by the Contracting Officer. Approved display sample sections shall remain on display at the jobsite during the construction period. Upon completion of construction, the display sample sections will be closed and sealed.

Pipe Insulation Display Sections: Display sample sections shall include as a minimum an elbow or tee, a valve, dielectric unions and flanges, a hanger with protection shield and insulation insert, or dowel as required, at support point, method of fastening and sealing insulation at longitudinal lap, circumferential lap, butt joints at fittings and on pipe runs, and terminating points for each type of pipe insulation used on the job, and for hot pipelines and cold pipelines, both interior and exterior, even when the same type of insulation is used for these services.

#### 1.4 STORAGE

Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants. Insulation



material and supplies that become dirty, dusty, wet, or otherwise contaminated may be rejected by the Contracting Officer.

## PART 2 PRODUCTS

### 2.1 GENERAL MATERIALS

Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either the wet or dry state. Materials to be used on stainless steel surfaces shall meet ASTM C 795 requirements. Materials shall be asbestos free and conform to the following:

#### 2.1.1 Adhesives

##### 2.1.1.1 Lagging Adhesive

Lagging is the material used for thermal insulation, especially around a cylindrical object. This may include the insulation as well as the cloth/material covering the insulation. Lagging adhesives shall be nonflammable and fire-resistant and shall have a flame spread rating no higher than 25 and a smoke developed rating no higher than 50 when tested in accordance with ASTM E 84. Adhesive shall be pigmented white red and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bounding fibrous glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations.

#### 2.1.2 Contact Adhesive

Adhesive may be dispersed in a nonhalogenated organic solvent or, dispersed in a nonflammable organic solvent which shall not have a fire point below 200 degrees F. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried adhesive shall not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 212 degrees F. The adhesive shall be nonflammable and fire resistant.

#### 2.1.3 Caulking

ASTM C 920, Type S, Grade NS, Class 25, Use A.

#### 2.1.4 Corner Angles

Nominal 0.016 inch aluminum 1 x 1 inch with factory applied kraft backing. Aluminum shall be ASTM B 209M, Alloy 3003, 3105, or 5005.

#### 2.1.5 Finishing Cement

Mineral fiber hydraulic-setting thermal insulating cement ASTM C 449/C 449M. All cements that may come in contact with Austenitic stainless steel must include testing per ASTM C 795.

#### 2.1.6 Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth and glass tape shall have flame spread and smoke developed ratings of no greater than 25/50 when measured in accordance with ASTM E 84. Tape shall be 4 inch wide rolls.

#### 2.1.7 Staples

Outward clinching type monel ASTM A 167, Type 304 or 316 stainless steel. Monel is a nickel rich alloy which has high strength, high ductility, and excellent resistance to corrosion.

#### 2.1.8 Wire

Soft annealed ASTM A 580/A 580M Type 302, 304 or 316 stainless steel, 16 or 18 gauge.

### 2.2 PIPE INSULATION MATERIALS

Pipe insulation materials shall be limited to those listed herein and shall meet the following requirements:

#### 2.2.1 Aboveground Hot Pipeline

Insulation for above 60 degrees F, for outdoor, indoor, exposed or concealed applications shall meet the following requirements. Supply the insulation with manufacturers recommended factory applied jacket.

- a. Calcium Silicate: ASTM C 533, Type I indoor only, or outdoors above 250 degrees F pipe temperature.
- b. Perlite Insulation: ASTM C 610.

##### 2.2.1.1 Domester Hot Water Piping

Hot water above ground shall be insulated with 1 inch thick fiberglass for sizes through 3 inch pipe and 1-1/2 inch thick fiberglass for sizes greater than 3 inch and with ASJ jacket. See hot water maintenance systems recommendations. Hot water underground shall be insulated with 1/2 inch thick plastic foam. Hot water piping concealed in walls or pipe chases may be insulated with 1/2 inch thick plastic foam.

#### 2.2.2 Aboveground Cold Pipeline

Cold water above ground shall be insulated with 1 inch thick fiberglass insulation with ASJ jacket. Cold water underground shall be insulated with 1/2 inch thick plastic foam. Cold water piping concealed in walls or pipe chases may be insulated with 1/2 inch thick plastic foam.

### 2.3 DUCT INSULATION MATERIALS

Duct insulation materials shall be limited to those listed herein and shall meet the following requirements:

#### 2.3.1 Flexible Cellular

ASTM C 534 Type II.

### 2.4 EQUIPMENT INSULATION MATERIAL

#### 2.4.1 Water Storage Tank

All surfaces shall be insulated with three pound density fiberglass board equal to Owens Corning #703 using 2 inch thickness. Insulation shall be cut, scored or mitered to fit the contour of equipment with edges tightly butted and secured with #18 galvanized hexagonal mesh wire and heavy coat of mineral fiber cement over insulation. Finish with 6 ounce canvas jacket applied with suitable adhesive. This contractor shall provide insulation on equipment furnished by him only unless otherwise specified. Break insulation at access panels, handholes, equipment, joints, etc.

### PART 3 EXECUTION

#### 3.1 APPLICATION - GENERAL

##### 3.1.1 Installation

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, the insulation will be rejected, and shall be immediately removed from the jobsite. Joints shall be staggered on multi layer insulation. Mineral fiber thermal insulating cement shall be mixed with demineralized water when used on stainless steel surfaces. Insulation, jacketing and accessories shall be installed in accordance with MICA Insulation Stds standard plates except where modified herein or on the drawings.

##### 3.1.2 Welding

No welding shall be done on piping, duct or equipment without written approval of the Contracting Officer. The capacitor discharge welding process may be used for securing metal fasteners to duct.

##### 3.1.3 Pipes/Ducts/Equipment which Require Insulation

Insulation is required on all engine-generator exhaust pipes, engine-generator exhaust ducts, or equipment, except for omitted items, as specified.

#### 3.2 PIPE INSULATION INSTALLATION

##### 3.2.1 Pipe Insulation

###### 3.2.1.1 General

Pipe insulation shall be installed on aboveground hot and cold pipeline systems as specified below to form a continuous thermal retarder, including straight runs, fittings and appurtenances unless specified otherwise. Installation shall be with full length units of insulation and using a

single cut piece to complete a run. Cut pieces or scraps abutting each other shall not be used. Pipe insulation shall be omitted on the following:

- a. Stormwater discharge piping.

#### 3.2.1.2 Pipes Passing Through Walls, Roofs, and Floors

- a. Pipe insulation shall be continuous through the sleeve.
- b. An aluminum jacket with factory applied moisture retarder shall be provided over the insulation wherever penetrations require sealing.
- c. Where penetrating interior walls, the aluminum jacket shall extend 2 inches beyond either side of the wall and shall be secured on each end with a band.
- d. Where penetrating floors, the aluminum jacket shall extend from a point below the backup material to a point 10 inches above the floor with one band at the floor and one not more than 1 inch from the end of the aluminum jacket.
- e. Where penetrating waterproofed floors, the aluminum jacket shall extend from below the backup material to a point 2 inches above the flashing with a band 1 inch from the end of the aluminum jacket.
- f. Where penetrating exterior walls, the aluminum jacket required for pipe exposed to weather shall continue through the sleeve to a point 2 inches beyond the interior surface of the wall.
- g. Where penetrating roofs, pipe shall be insulated as required for interior service to a point flush with the top of the flashing and sealed with vapor retarder coating. The insulation for exterior application shall butt tightly to the top of flashing and interior insulation. The exterior aluminum jacket shall extend 2 inches down beyond the end of the insulation to form a counter flashing. The flashing and counter flashing shall be sealed underneath with caulking.

#### 3.2.1.3 Pipes Passing Through Hangers

- a. Insulation, whether hot or cold application, shall be continuous through hangers. All horizontal pipes 2 inches and smaller shall be supported on hangers with the addition of a Type 40 protection shield to protect the insulation in accordance with MSS SP-69. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, insulation inserts as specified below for piping larger than 2 inches shall be installed.
- b. Horizontal pipes larger than 2 inches at 60 degrees F and above shall be supported on hangers in accordance with MSS SP-69.
- c. Vertical pipes shall be supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-69 covering the 360 degree arc of the insulation. An insulation insert of cellular glass or calcium silicate shall be installed between each shield and the pipe. The insert shall cover the 360 degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches

on each end beyond the protection shield. When insulation inserts are required per the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation, as an option instead of installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert. The vertical weight of the pipe shall be supported with hangers located in a horizontal section of the pipe. When the pipe riser is longer than 30 feet, the weight of the pipe shall be additionally supported with hangers in the vertical run of the pipe which are directly clamped to the pipe, penetrating the pipe insulation. These hangers shall be insulated and the insulation jacket sealed as indicated herein for anchors in a similar service.

- d. Inserts shall be covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, shall overlap the adjoining pipe jacket 1-1/2 inches, and shall be sealed as required for the pipe jacket. The jacket material used to cover inserts in flexible cellular insulation shall conform to ASTM C 1136, Type 1, and is allowed to be of a different material than the adjoining insulation material.

### 3.2.2 Aboveground Hot Pipelines

The following hot pipelines above 60 degrees F shall be insulated per Table II:

- a. Engine exhaust pipe.

#### 3.2.2.1 Insulation Thickness

Insulation thickness for hot pipelines shall be determined using Table II.

#### LEGEND:

CS - Calcium Silicate

PL - Perlite

Table II - Hot Piping Insulation Thickness  
Pipe Size (inches)

| Type of Service<br>(degrees F) | Material | Runouts<br>up to<br>2 in * | 1 in<br>&<br>less | 1.25 -<br>2<br>in | 2.5 -<br>4<br>in | 5 -<br>6<br>in | 8 in<br>&<br>larger |
|--------------------------------|----------|----------------------------|-------------------|-------------------|------------------|----------------|---------------------|
| Engine Exhaust<br>(-1200 F)    | CS/PL    | 2.0                        | 3.5               | 4.0               | 4.5              | 5.0            | 5.5                 |

\* When runouts to terminal units exceed 12 feet, the entire length of runout shall be insulated like the main feed pipe.

#### 3.2.2.2 Jacket for Insulated Hot Pipe, Except Pipe Insulated with Flexible Cellular

Insulation shall be covered, in accordance with manufacturer's recommendations, with a factory applied Type II jacket or field applied aluminum where required or seal welded PVC.

#### 3.2.2.3 Insulation for Straight Runs

- a. Insulation shall be applied to the pipe with joints tightly butted.
- b. Longitudinal laps of the jacket material shall overlap not less than 1-1/2 inches, and butt strips 3 inches wide shall be provided for circumferential joints.
- c. Laps and butt strips shall be secured with adhesive and stapled on 4 inch centers if not factory self-sealing. Adhesive may be omitted where pipe is concealed.
- d. Factory self-sealing lap systems may be used when the ambient temperature is between 40 degrees and 120 degrees F and shall be installed in accordance with manufacturer's instructions. Laps and butt strips shall be stapled whenever there is nonadhesion of the system. Where gaps occur, the section shall be replaced or the gap repaired by applying adhesive under the lap and then stapling.
- e. Breaks and punctures in the jacket material shall be patched by either wrapping a strip of jacket material around the pipe and securing with adhesive and staple on 4 inch centers (if not factory self-sealing), or patching with tape and sealing with a brush coat of vapor retarder coating. Adhesive may be omitted where pipe is concealed. Patch shall extend not less than 1-1/2 inches past the break.
- f. Flexible cellular pipe insulation shall be installed by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unsplit sections over the open ends of piping or tubing. All seams and butt joints shall be secured and sealed with adhesive. When using self seal products only the butt joints shall be secured with adhesive. Insulation shall be pushed on the pipe, never pulled. Stretching of insulation may result in open seams and joints. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp knives shall be used. Type II sheet insulation when used on pipe larger than 6 inches shall not be stretched around the pipe. On pipes larger than 12 inches, adhere sheet insulation directly to the pipe on the lower 1/3 of the pipe.

#### 3.2.2.4 Insulation for Fittings and Accessories

- a. Pipe insulation shall be tightly butted to the insulation of the fittings and accessories.
- b. Precut or preformed insulation shall be placed around all fittings and accessories and shall conform to MICA plates, except as modified herein: 5 for anchors; 10, 11, 12, and 13 for fittings; 14, 15 and 16 for valves; 17 for flanges and unions; and 18 for couplings. Insulation shall be the same as the pipe insulation, including same density, thickness, and thermal conductivity. Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required.

Insulation of the same thickness and conductivity as the adjoining pipe insulation shall be used. If nesting size insulation is used, the insulation shall be overlapped 2 inches or one pipe diameter. Elbows insulated using segments shall conform to MICA Tables 12.20 "Mitered Insulation Elbow".

- c. Upon completion of installation of insulation on flanges, unions, valves, anchors, fittings and accessories, terminations and insulation not protected by factory vapor retarder jackets or PVC fitting covers shall be protected with two coats of adhesive applied with glass tape embedded between coats. Tape seams shall overlap 1 inch. Adhesive shall extend onto the adjoining insulation not less than 2 inches. The total dry film thickness shall be not less than 1/16 inch.
- d. Insulation terminations shall be tapered to unions at a 45-degree angle.
- e. At the option of the Contractor, factory premolded one- or two-piece PVC fitting covers may be used in lieu of the adhesive and embedded glass tape. Factory premolded segments or factory or field cut blanket insert insulation segments shall be used under the cover and shall be the same thickness as adjoining pipe insulation. The covers shall be secured by PVC vapor retarder tape, adhesive, seal-welding or with tacks made for securing PVC covers.

#### 3.2.2.5 Insulation for Fittings

Flanges, unions, valves, fittings, and accessories shall be insulated and finished as specified for the applicable service. Two coats of breather emulsion type weatherproof mastic (impermeable to water, permeable to air) recommended by the insulation manufacturer shall be applied with glass tape embedded between coats. Tape overlaps shall be not less than 1 inch and the adjoining aluminum jacket not less than 2 inches. Factory preformed aluminum jackets may be used in lieu of the above. Molded PVC fitting covers shall be provided when PVC jackets are used for straight runs of pipe. PVC fitting covers shall have adhesive welded joints and shall be weatherproof.

### 3.3 DUCT INSULATION INSTALLATION

Except for oven hood exhaust duct insulation, corner angles shall be installed on external corners of insulation on ductwork in exposed finished spaces before covering with jacket. Duct insulation shall be omitted on exposed supply and return ducts in air conditioned spaces where the difference between supply air temperature and room air temperature is less than 15 degrees F unless otherwise shown. Air conditioned spaces shall be defined as those spaces directly supplied with cooled conditioned air (or provided with a cooling device such as a fan-coil unit) and heated conditioned air (or provided with a heating device such as a unit heater, radiator or convector).

#### 3.3.1 Duct Insulation Thickness

Duct insulation thickness shall be in accordance with Table III.

Table III - Minimum Duct Insulation (inches)

| Type of Service<br>(degrees F)       | Material          | Min. Thickness<br>(in.) |
|--------------------------------------|-------------------|-------------------------|
| Engine-Generator Exhaust Duct (-200) | Flexible cellular | 3                       |

Maximum thickness for flexible cellular insulation shall not exceed 1 inch and maximum thickness for polyisocyanurate foam insulation shall not exceed 1.5 inch, to comply with ASTM E 84 flame spread/smoke developed ratings of 25/50.

### 3.3.2 Installation on Exposed Duct Work

- a. For rectangular ducts, rigid insulation shall be secured to the duct by mechanical fasteners on all four sides of the duct, spaced not more than 12 inches apart and not more than 3 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger. One row shall be provided for each side of duct less than 12 inches.
- b. Duct insulation shall be formed with minimum jacket seams. Each piece of rigid insulation shall be fastened to the duct using mechanical fasteners. When the height of projections is less than the insulation thickness, insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over. Vapor retarder jacket shall be continuous across seams, reinforcing, and projections. When height of projections is greater than the insulation thickness, insulation and jacket shall be carried over.
- c. Insulation shall be impaled on the fasteners; self-locking washers shall be installed and the pin trimmed or bent over.
- d. Joints in the insulation jacket shall be sealed with a 4 inchwide strip of tape. Tape seams shall be sealed with a brush coat of vapor retarder coating.
- e. Breaks and ribs or standing seam penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with tape and stapled. Staples and joints shall be sealed with a brush coat of vapor retarder coating.
- f. At jacket penetrations such as hangers, thermometers, and damper operating rods, the voids in the insulation shall be filled and the penetrations sealed with a brush coat of vapor retarder coating.
- g. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish. The coating shall overlap the adjoining insulation and uninsulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.



- h. Oval and round ducts, flexible type, shall be insulated with factory Type I jacket insulation with minimum density of 3/4 pcf, attached as per MICA standards.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15400

PLUMBING

PART 1 GENERAL

- 1.1 SCOPE
- 1.2 DESCRIPTION OF THE SYSTEM
- 1.3 REFERENCES
- 1.4 SUBMITTALS
- 1.5 GENERAL PROVISIONS
  - 1.5.1 Drawings
  - 1.5.2 Materials
  - 1.5.3 Equipment Substitutions
    - 1.5.3.1 Approval of Substitutions

PART 2 PRODUCTS

- 2.1 PIPING SYSTEMS
  - 2.1.1 Exterior Water
    - 2.1.1.1 Fittings
    - 2.1.1.2 Soldered Joints
    - 2.1.1.3 Pipe and Fittings
    - 2.1.1.4 Valves for Water Service
    - 2.1.1.5 Blow Out Tee
  - 2.1.2 Interior Water
    - 2.1.2.1 Piping Below Floor Slab
    - 2.1.2.2 Piping Above Floor
  - 2.1.3 Exterior Sanitary Building Sewer
  - 2.1.4 Frost Protection - Sanitary Sewers
  - 2.1.5 Interior Sanitary and Vent
  - 2.1.6 Horizontal Soil and Storm Lines
- 2.2 PIPE HANGERS
  - 2.2.1 Support Spacing
- 2.3 VALVES
  - 2.3.1 General
  - 2.3.2 Control Valve
  - 2.3.3 Hot and Cold Water
    - 2.3.3.1 Ball Valves
    - 2.3.3.2 Check Valves
- 2.4 INSULATION
  - 2.4.1 General
    - 2.4.1.1 Fire and Smoke Hazard Ratings
    - 2.4.1.2 Thickness
    - 2.4.1.3 Vapor Seal
    - 2.4.1.4 Openings
    - 2.4.1.5 Preformed Pipe Insulation
    - 2.4.1.6 Fittings, Valve Bodies, and Flanges
    - 2.4.1.7 Pipe Expansion
  - 2.4.2 Insulation Protection

## Grand Forks Phase 2 Levees

- 2.4.2.1 High Moisture
- 2.4.2.2 Weather Exposure
- 2.4.2.3 Joints
- 2.4.3 Domestic Water Piping
  - 2.4.3.1 Cold Water Above Ground
  - 2.4.3.2 Hot Water Above Ground
  - 2.4.3.3 Water Under Ground
  - 2.4.3.4 Concealed Water
- 2.4.4 Water Storage Tank
- 2.5 PLUMBING SPECIALTIES
  - 2.5.1 Traps
  - 2.5.2 Cleanouts - Floor
  - 2.5.3 Cleanouts - Wall Access
  - 2.5.4 Floor Drains
  - 2.5.5 Water Hammer Arrestors
  - 2.5.6 WH-1 Wall Hydrants
  - 2.5.7 Thermometers
  - 2.5.8 HB-1 Hose Bibb
- 2.6 EQUIPMENT
  - 2.6.1 Electric Water Heaters
  - 2.6.2 Water Storage Tank
  - 2.6.3 Water Heater/Storage Tank Safety Devices
    - 2.6.3.1 Storage Type Water Heaters and Tanks
    - 2.6.3.2 Non-Storage Type Water Heaters
    - 2.6.3.3 Temperature and Pressure Relief Valves
    - 2.6.3.4 Relief Valve
    - 2.6.3.5 Safety Devices
- 2.7 FIXTURES AND TRIM
  - 2.7.1 Vitreous China Fixtures
  - 2.7.2 Exposed Trim
  - 2.7.3 Fixture Location
  - 2.7.4 Water Flow
  - 2.7.5 Fixtures and Trim
  - 2.7.6 Fixture Support
  - 2.7.7 Caulk
- 2.8 PLUMBING FIXTURES
  - 2.8.1 WC-1 Water Closet (ADA)
    - 2.8.1.1 Flush Valve
    - 2.8.1.2 Seat
    - 2.8.1.3 Grab Bars
    - 2.8.1.4 Carrier
  - 2.8.2 WC-2 Water Closet
    - 2.8.2.1 Flush Valve
    - 2.8.2.2 Seat
    - 2.8.2.3 Grab Bars
    - 2.8.2.4 Carrier
  - 2.8.3 SS-1 Service Sink
    - 2.8.3.1 Faucet
  - 2.8.4 DF-1 Drinking Fountain
    - 2.8.4.1 Supply
    - 2.8.4.2 Trap

## PART 3 EXECUTION

- 3.1 Execution
  - 3.1.1 Workmanship
  - 3.1.2 Painting
  - 3.1.3 Excavation and Backfill
  - 3.1.4 Cutting and Patching

Grand Forks Phase 2 Levees

- 3.1.5 Access
- 3.1.6 Equipment and Piping
- 3.2 SLEEVES AND INSERTS
- 3.3 MOUNTING PADS
- 3.4 IDENTIFICATION
  - 3.4.1 Valve Identification
  - 3.4.2 Concealed Valves and Equipment Identification
- 3.5 ESCUTCHEONS
- 3.6 TESTS AND ADJUSTMENTS
  - 3.6.1 Tests
    - 3.6.1.1 Start Up of Piping Systems
- 3.7 REQUIREMENTS FOR SUBSTANTIAL COMPLETION
  - 3.7.1 Cleaning Equipment and Premises
  - 3.7.2 Operating and Maintenance Manuals
    - 3.7.2.1 Manuals
    - 3.7.2.2 Training
- 3.8 PENETRATIONS OF FIRE RESISTIVE ASSEMBLIES
- 3.9 ATTACHMENTS

-- End of Section Table of Contents --

SECTION 15400

PLUMBING

PART 1 GENERAL

1.1 SCOPE

Applicable provisions of Division 1 shall govern work under this section. The Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the drawings and/or herein specified, including all materials, equipment, and incidentals necessary to produce a complete and operating system.

1.2 DESCRIPTION OF THE SYSTEM

Provide fixtures, specialties, equipment and all related piping as shown on floor plans, scheduled, and/or specified for a complete working system.

Provide all necessary sanitary waste, vent, and water piping, and ventilating as shown on floor plans, scheduled, and/or specified for a complete working system.

Provide electric water heater as shown on floor plans, schedule and/or specified.

Provide all sanitary waste and vent piping as shown from a point 5 feet outside building wall to all fixtures and/or appliances. Coordinate location and invert on sanitary sewer connection point to sewer line 5 feet outside building wall before proceeding with any work.

Provide all water piping as shown from a point 5 feet outside building wall to all fixtures and/or appliances.

All water piping shall be installed with pitch for seasonal drainage. This building is for seasonal use.

Contractor to properly instruct the Contracting Officer's Representative in the winterizing of the plumbing systems which includes the draining down water piping and removing water in service to meter, drainage of storage tank, and using RV anti-freeze. Winterize all traps by water removal and filling with RV anti-freeze.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY OF SANITARY ENGINEERING FOR PLUMBING AND SANITARY RESEARCH (ASSE)

ASSE 1052

(1993) Hose Connection Backflow Preventers

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |   |
|-------------|---|
| ASTM B 32   | (1996) Solder Metal   |
| ASTM B 42   | (1998) Seamless Copper Pipe, Standard Sizes   |
| ASTM B 88   | (1999) Seamless Copper Water Tube   |
| ASTM D 321  | (1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals       |
| ASTM D 2564 | (1996a) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems           |
| ASTM D 2665 | (1998) Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings      |
| ASTM D 2855 | (1996) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings |
| ASTM D 3034 | (1998) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings                      |

ASME INTERNATIONAL (ASME)

|             |  |
|-------------|--|
| ASME B16.18 | (1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings  |
| ASME B16.22 | (1995; B16.22a1998) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings   |
| ASME B16.23 | (1992; Errata Jan 1994) Cast Copper Alloy Solder Joint Drainage Fittings - DWV   |
| ASME B16.26 | (1988) Cast Copper Alloy Pip Flanges, Class 150, 300, 400, 600, 900, 1500, and 2500, and Flanged Fittings, Class 150 and 300 |
| ASME B16.29 | (1994) Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV  |

CAST IRON SOIL PIPE INSTITUTE (CISPI)

|           |   |
|-----------|---|
| CISPI 301 | (1997) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications                                     |
| CISPI 310 | (1997) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications |

ENGINEERING MANUALS (EM)

|            |   |
|------------|---|
| EM 385-1-1 | (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual |
|------------|---|

UNDERWRITERS LABORATORIES (UL)

UL 723

(1996; Rev thru Dec 1998) Test for Surface  
Burning Characteristics of Building  
Material

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Shop Drawings; GA.

Shop drawings shall contain complete dimensional, operational, material quality and manufacturer information on all fixture, specialty and equipment items. The Contractor shall be responsible for transmitting copies of the approved shop drawings to the other affected trades. Shop drawings are required on the following items:

- a. Fixtures and Trim
- b. Piping, Fittings, Drains and Cleanouts
- c. Valves
- d. Water Heater EWH-1
- e. Storage Tank ST-1

1.5 GENERAL PROVISIONS

1.5.1 Drawings

Plans of piping and fixtures shown on scale drawings, are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction and approximate general arrangement of one phase of work to another, but not to the exact detail or arrangement of construction. Plans are based on equipment scheduled. Contractor shall be responsible for changes resulting from equipment other than scheduled.

If it is found before installation, that a more convenient, suitable or workable arrangement for any or all phases of the project would result by varying or altering the arrangement indicated on the drawings, Contractor may change the location or arrangement of his work without additional cost to the Government but only after obtaining a written approval by the Contracting Officer.

Mechanical systems are shown on drawings that were closely coordinated with the Architectural drawings, however, minor variations may occur. Contractor shall verify dimensions, heights, door swings, and any other information critical to the placement of devices, with the architectural drawings to assure proper installation. Field measurements shall take precedence over drawing dimensions and shall be verified. Plans shall not be scaled to locate equipment.

All plumbing piping installations shall closely match the drawings as approved by the current North Dakota Plumbing Code. Any variation from or additions to the piping arrangement will require a revision or resubmittal to the Contracting Officer at the Contractor's expense.

#### 1.5.2 Materials

Each major component of the equipment shall have the manufacturer's name, address, catalog and serial number permanently attached in a conspicuous place.

The same brand or manufacturer shall be used for each specific application of fixtures, pumps, valves, fittings, controls and other equipment.

All materials shall be new and of the quality specified and meet approval as per current North Dakota Plumbing Code.

All equipment shall be listed, approved or rated by a nationally recognized testing and rating bureau or the recognized manufacturers association responsible for setting industry standards. All electrical equipment and apparatus shall be U.L. listed. Examples of recognized associations are:

- American Concrete Pipe Association
- American Pipe Fitting Institute
- American Water Works Association
- Plastic Pipe Institute
- Thermal Insulation Manufacturers Association

#### 1.5.3 Equipment Substitutions

It is the intent of this specification to permit the use of the materials of any nationally recognized manufacturer so long as they are fully equal to the quality and performance of the named item in the opinion of the Contracting Officer. Materials or equipment of other manufacturers may be used upon the following conditions:

- a. The proposed substitute is equal in design, materials, construction and performance in the opinion of the Contracting Officer. No compromise in quality level will be allowed.
- b. The service capabilities, availability of service parts and stability of the manufacturer are adequate in the opinion of the Contracting Officer.
- c. The Contractor assumes responsibility for any modifications required for the installation of substitute equipment.
- d. Substitute equipment shall fit into the space provided with adequate provisions for service and maintenance and must meet product approval as per current North Dakota Plumbing Code. Any substitute equipment that causes variation of or deviation from original piping arrangement may require a revision to be submitted to the Contracting Officer at the Contractor's expense.

##### 1.5.3.1 Approval of Substitutions

Approval of materials and equipment will be by review and approval of project shop drawings.



## PART 2 PRODUCTS

### 2.1 PIPING SYSTEMS

#### 2.1.1 Exterior Water

Type "K" soft temper copper pipe with a working pressure of 150 psig at 73.4° F. and in accordance with ASTM B 42 and ASTM B 88 standards.

##### 2.1.1.1 Fittings

Wrot copper solder joint fittings in accordance with ASME B16.22 and ASME B16.29.

Cast copper alloy solder joint fittings in accordance with ASME B16.18; ASME B16.23; and ASME B16.26.

##### 2.1.1.2 Soldered Joints

Clean all surfaces per manufacturers installation recommendations. Apply non-toxic flux to all joint surfaces. Jointing shall be made with lead-free solder conforming to ASTM B 32.

##### 2.1.1.3 Pipe and Fittings

All pipe and fittings shall be installed per manufacturer's recommendations.

##### 2.1.1.4 Valves for Water Service

Valves for water service shall have ends suited for proper installation in piping. Valves shall meet local standards or, in absence of such standards, the requirements below.

a. Curb stop (3/4 inch thru 2 inch size) Minneapolis pattern H-15150 or H-15250 equal to Mueller Co. or McDonald.

b. Curb Box. Minneapolis pattern base, cast iron extension type, 1 foot telescope length, 7 foot length minimum, cast iron lid with plug.

##### 2.1.1.5 Blow Out Tee

Provide and install curb box with water line blow out tee in main service to building.

#### 2.1.2 Interior Water

##### 2.1.2.1 Piping Below Floor Slab

Type "K" soft temper copper with wrot copper solder joint fittings and jointing material shall be lead free solder and non-toxic flux.

##### 2.1.2.2 Piping Above Floor

Type "L" hard tempered copper with wrot copper solder joint fittings and jointing material shall be lead free solder and non-toxic flux.

#### 2.1.3 Exterior Sanitary Building Sewer

PVC Pipe, ASTM D 3034, with rubber gasket joints, ASTM D 3212. Schedule 40 PVC, ASTM D 2665, with solvent cement joints, ASTM D 2564. Fittings required shall meet specifications for respective piping. Provide cleanouts as required per current North Dakota Plumbing Code.

#### 2.1.4 Frost Protection - Sanitary Sewers

Piping shall be protected per current North Dakota Plumbing Code. The insulation shall be built up with 1 inch extruded polystyrene insulation to required thickness with staggered joints.

#### 2.1.5 Interior Sanitary and Vent

- a. Above grade sanitary piping: Cast iron no-hub pipe (CISPI 301) with mechanical sleeve joints (CISPI 310). Tyler pipe and fittings.
- b. Not Used.
- c. Vent Piping: Schedule 40 PVC pipe (ASTM D 2665) with socket solvent cemented joints (ASTM D 2855). PVC piping shall not run in air plenum ceilings, air shafts or ducts.
- d. Fittings required shall meet specifications for respective piping.
- e. Extend vents 12 inches above finished roof or above normal snow depth.
- f. Provide approved roof flashing to correspond with roof covering being installed or with existing roof covering. Verify with roof installer so as to not void warranty of roof.

#### 2.1.6 Horizontal Soil and Storm Lines

Lines shall pitch down a minimum of 1/8 inch per foot in the direction of flow, or as indicated on the drawings. Soil and waste branch piping shall pitch down 1/4 inch per foot. All vent piping shall drip back into waste piping. Stacks shall be run vertically. Changes of direction 45° or more from vertical to horizontal shall be made with long sweep elbows. Horizontal changes in direction shall be made with "Y" or "Y" and 1/8 bend combination fitting.

### 2.2 PIPE HANGERS

Furnish and install suitable hangers and supports for all horizontal lines. Hangers and supports shall be Grinnell, Mason, F&M, Michigan or equal. Hangers and supports shall be galvanized. Heavy pipes shall be carried by pipe hangers supported by rods secured to structure. No piping shall be hung from other piping or ductwork. In no case shall hangers be supported by means of vertical expansion bolts.

#### 2.2.1 Support Spacing

Piping shall be supported at distances not to exceed those specified.

| Pipe Material           | Maximum<br>Horizontal Spacing (feet) | Maximum<br>Vertical Spacing (feet) |
|-------------------------|--------------------------------------|------------------------------------|
| Acrylonitrile Butadiene |                                      |                                    |

## Grand Forks Phase 2 Levees

| Pipe Material                          | Maximum<br>Horizontal Spacing (feet) | Maximum<br>Vertical Spacing (feet) |
|--|--------------------------------------|------------------------------------|
| Styrene (ABS)                          | 4                                    | 10                                 |
| Brass                                  | 10                                   | 10                                 |
| Cast Iron                              | 5a                                   | 15                                 |
| Copper or Copper-Alloy Pipe            | 12                                   | 10                                 |
| Copper or Copper-Alloy Tubing          |                                      |                                    |
| £ 1-1/4 inch diameter                  | 6                                    | 10                                 |
| ³ 1-1/2 inch diameter                  | 10                                   | 10                                 |
| Chlorinated Polyvinyl Chloride (CPVC): |                                      |                                    |
| £ 1 inch diameter                      | 3                                    | 5b                                 |
| ³ 1-1/4 inch diameter                  | 4                                    | 6b                                 |
| Crosslinked Polyethylene (PEX)         | 2-2/3                                | 4                                  |
| Ductile Iron                           | 5a                                   | 15                                 |
| Galvanized Steel                       | 12                                   | 15                                 |
| Lead                                   | Continuous                           | 4                                  |
| Polybutylene (PB)                      | 2-2/3                                | 4                                  |
| Polyvinyl Chloride                     | 4                                    | 10                                 |
| Stainless Steel                        | 12                                   | 15                                 |

Note A: The maximum horizontal spacing for supports may be increased to 10 feet when 10-foot lengths of pipe are employed.

Note B: Mid-story guide is to be employed.

Note C:       "       " means less than or equal to.  
          "       " means greater than or equal to.

## 2.3 VALVES

### 2.3.1 General

Provide all valves shown on the plans and as required by applicable state and local codes. Valves manufactured by Milwaukee, Nibco, Jomar, Watts or Apollo are acceptable. All valves shall be suitable for 125 psig working pressure unless otherwise specified.

### 2.3.2 Control Valve

A control valve for water supply piping 3/4 inches through 4 inches in diameter which serves 2 or more plumbing fixtures shall have a nominal diameter at least equal to the piping.

### 2.3.3 Hot and Cold Water

#### 2.3.3.1 Ball Valves

4 inches and smaller. Two or three piece bronze body, full port, blow out proof stainless steel stem, brass ball with hard chrome plating, TFE seat rings, plated steel handle.

#### 2.3.3.2 Check Valves

3 inches and smaller. Bronze body horizontal swing, Buna-N disc, stainless steel pin and lever.

## 2.4 INSULATION

### 2.4.1 General

The work covered by this specification consists in furnishing all labor, equipment, accessories and materials and in performing all operations necessary for the installation of all insulation for the plumbing piping systems. Insulation shall be installed in strict accordance with the insulation section of this specification and applicable drawings, subject to the terms and conditions of the contract. All insulation shall be installed in a workmanlike manner by skilled workmen regularly engaged in this type of work. Insulation shall be Johns-Manville, Armstrong, Fiberglass, Knauph, or products of equal quality and performance.

#### 2.4.1.1 Fire and Smoke Hazard Ratings

All insulation shall have composite (insulation, jacket, or facing, and adhesive used to adhere the facing or jacket to the insulation) fire and smoke hazard ratings as tested by procedure UL 723 not exceeding: Flame spread 25; Smoke developed 50; fuel contributed 50; UL fire hazard Classification 1. Accessories, such as adhesives, plastics, cements, taps or glass fabric for fittings shall be the same component ratings as listed above.

#### 2.4.1.2 Thickness

Insulation thickness specified herein is based on a conductivity of 0.22 BTU/sq ft/degree F/hour at 75 degrees F mean temperature. If insulating materials with substantially different thermal properties are used the thickness of insulation shall be adjusted to provide the overall insulating efficiency of the material specified.

#### 2.4.1.3 Vapor Seal

Insulation on all cold surfaces where vapor barrier jackets are used shall be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vaporsealed to prevent condensation.

#### 2.4.1.4 Openings

All insulation shall be continuous through walls and ceiling openings and sleeves where applicable.

#### 2.4.1.5 Preformed Pipe Insulation

Preformed pipe insulation shall be two-piece or one-piece fiberglass composite with vinyl coated embossed vapor barrier laminate and pressure sealing lap similar to Owens Corning Fiberglass 25ASJ or Johns-Manville A.P. The insulation systems shall be suitable for piping operating between 50 degrees F to 450 degrees F. The insulation system shall be vermin-proof, rot-free, non-shrinking with a moisture absorption not exceeding 0.2 percent by volume after 96 hours at 120 degrees F and 95 percent relative humidity. Jacket permanence shall not exceed 0.2 percent perms and shall have a Beach puncture rating of at least 50 units.

#### 2.4.1.6 Fittings, Valve Bodies, and Flanges

Fittings, valve bodies and flanges for pipe sizes 6 inch and smaller shall

be finished with fiberglass inserts and PVC fitting covers. One (1) insert to be used for pipe insulation of 1 inch thickness. An additional insert to be used for each additional 1 inch or fraction thereof for pipe insulation above 1 inch thickness.

#### 2.4.1.7 Pipe Expansion

Make adequate provisions for expansion of piping. Unions to be left uncovered and clean. Finished surfaces of insulation are to be suitable for painting.

#### 2.4.2 Insulation Protection

##### 2.4.2.1 High Moisture

Insulation exposed to high moisture of interior areas shall be encased with 15 mil. vinyl film.

##### 2.4.2.2 Weather Exposure

Insulation exposed to weather shall be encased with 20 mil. vinyl film.

##### 2.4.2.3 Joints

All joints sealed as recommended by manufacturer.

#### 2.4.3 Domestic Water Piping

##### 2.4.3.1 Cold Water Above Ground

Cold water above ground shall be insulated with 1 inch thick fiberglass insulation with ASJ jacket.

##### 2.4.3.2 Hot Water Above Ground

Hot water above ground shall be insulated with 1 inch thick fiberglass for sizes through 3 inch pipe and 1-1/2 inch thick fiberglass for sizes greater than 3 inch and with ASJ jacket. See hot water maintenance systems recommendations.

##### 2.4.3.3 Water Under Ground

Hot and cold water underground shall be insulated with 1/2 inch thick plastic foam.

##### 2.4.3.4 Concealed Water

Hot and cold water piping concealed in walls or pipe chases may be insulated with 1/2 inch thick plastic foam.

#### 2.4.4 Water Storage Tank

All surfaces shall be insulated with three pound density fiberglass board equal to Owens Corning #703 using 2 inch thickness. Insulation shall be cut, scored or mitered to fit the contour of equipment with edges tightly butted and secured with #18 galvanized hexagonal mesh wire and heavy coat of mineral fiber cement over insulation. Finish with 6 oz. canvas jacket applied with suitable adhesive. This contractor shall provide insulation on equipment furnished by him only unless otherwise specified. Break

insulation at access panels, handholes, equipment, joints, etc.

## 2.5 PLUMBING SPECIALTIES

### 2.5.1 Traps

Every fixture and floor drain shall be provided with a proper trap placed near the outlet and properly vented. Traps shall be cast iron hub and spigot where used in soil pipe or nohub with approved stainless steel couplings. Traps for threaded pipe shall be screwed drainage pattern cast iron "P" traps. Where approved, PVC traps with adjustable compression fittings may be used. All exposed traps for sinks, lavatories and similar fixtures shall be chrome plated "P" traps, or as specified with the fixture trim. All traps shall have a minimum seal of 2 inch.

### 2.5.2 Cleanouts - Floor

Based on product by Zurn. Cleanouts of equal quality by Wade, Sioux Chief, Josam or Ancon are acceptable. Cleanout shall be set flush with floor. Covers shall be round or square scoriated nickel bronze. All cleanouts shall be full size of the pipe it serves thru 6 inches and 6 inches for sizes 8 inches and larger. Zurn Z-1400NH or NL, gasketed seal - bronze or PVC plug (light to medium traffic).

### 2.5.3 Cleanouts - Wall Access

Based on product by Sioux Chief Products Co. Wall access plates of equal quality by J.R. Smith, Wade, Josam, Ancon, and Zurn are acceptable. Wall access covers shall be heavy duty round stainless steel for size 5-1/2 inch diameter thru 8-1/2 inch diameter and standard duty round stainless steel for diameters 10-1/2 inches and 12-1/2 inches. Each wall access cover shall be secured to wall by a tapped, behind the wall, bar and a chrome plated threaded bolt. Sioux Chief wall access covers #SS-1015 HD, SS-1016HD, SS-1018HD, SS-1010 and SS-1025.

### 2.5.4 Floor Drains

Provide and install floor drains where shown and size indicated on the drawings of the type listed below. Floor drains shall be set level and at the proper elevation to drain the surrounding floor area. All floor drains set in floors above habitable space shall be equipped with 4# per square foot sheet lead safing or approved vinyl type extending a minimum of 18 inches beyond rim of floor drain in all directions. Based on product by Zurn.

Ventonite, Inc. - Atlanta, Georgia.

ACD Pourable Underlayment, International, Inc. - Pittsburgh, PA

Ardex V-800, Levelcrete by Ardex, Inc. - Pittsburgh, PA

Latex Cement by Master Builders/Martin Marretta - Cleveland, OH

FD-1 Floor Drain

Zurn ZN-415 w/Type B Strainer

Cast iron body, reversible clamping collar for high or low setting, round nickel bronze adjustable strainer. Strainer diameter shall be 5" for 2" outlets, 6" for 3" outlets thru 8" for 4" outlets.

Floor Drains of equal quality by Wade, Josam, Ancon or Smith are acceptable.

#### 2.5.5 Water Hammer Arrestors

Provide water hammer arrestors on hot and cold water piping where shown on drawings. Water hammer arrestors shall be sized and located in accord with the hydraulic design of the piping system served and to the manufacturer's recommendations. Mechanical water hammer arrestors shall be accessible. Arrestors manufactured by J.R. Smith, Wade, Josam, Zurn, Sioux Chief or Precision Plumbing Products are acceptable.

ARRESTOR SIZING TABLE

| P.D. I. Units | Fixture Units | Plan Symbol |
|---------------|---------------|-------------|
| A             | 1-11          | "A"         |
| B             | 12-32         | "B"         |
| C             | 33-60         | "C"         |
| D             | 61-113        | "D"         |
| E             | 114-154       | "E"         |
| F             | 155-330       | "F"         |

#### 2.5.6 WH-1 Wall Hydrants

Provide and install where shown on the drawings Woodford Model #67 automatic draining freezeless wall hydrant with chrome plated finish, removable "T" handle key, vacuum breaker and anti-siphonage outlet (ASSE #1052). Seal hole through all around hydrant with grout or caulking to make water tight and air tight. Provide stop and waste valves in lines preceding all hydrants. Wall hydrants equal in quality by J.R. Smith, Josam, Wade or Zurn are acceptable.

#### 2.5.7 Thermometers

Provide thermometers in water systems for monitoring system. Thermometers shall be industrial grade with 9 inch aluminum case, black finish, aluminum stems, 2-1/2 inch insertion, clear acrylic window, red indicator on white scale, and brass well socket. Thermometers shall be adjustable type with range as best suited to application. Mount thermometers in a position so as to be visible from a convenient floor location. Instruments shall be Trerice Series A005. Enrst Gauge Co. or Crosby are acceptable. Provide thermometers in the following locations:

- a. Water heaters in hot building supply.

#### 2.5.8 HB-1 Hose Bibb

Woodford Model 26, 3/4 inch chrome plated brass faucet with loose key handle and vacuum breaker (ASSE 1052) with 3/4 inch male hose thread, or equal product.

### 2.6 EQUIPMENT

#### 2.6.1 Electric Water Heaters

See Schedule for size and characteristics. Heaters shall be glass lined steel, tested under 125 psi hydrostatic pressure prior to lining, and provided with anodic protection, external drain valve and ASME rated temperature and pressure relief valve. Heating elements shall be direct immersion type, heavy duty, Incoloy sheathed, low voltage density (75 watts per square inch) of capacity and arrangement as scheduled. Controls shall

include contactors, adjustable thermostats and high limit thermostat (set point 205 degrees F). Tank shall be insulated with polyurethane foam insulation with a minimum R-value of 16. The entire unit shall be U.L. approved and labelled. Heater by Rheem, Lockinvar, A.O. Smith, or State Industries are acceptable.

#### 2.6.2 Water Storage Tank

(Small Volume) Provide and install where shown on plans and as scheduled a carbon steel, cement lined, constructed, designed and stamped in accordance with ASME Code for working pressure of 125 psig as manufactured by Cemline, or equal. Provide pressure relief valve (see Schedule).

Also provide unions, ball valves bypass piping, pressure relief valve set at 75 psig, and drain valve as per detail. Insulate exterior of pressure tank as per specifications.

#### 2.6.3 Water Heater/Storage Tank Safety Devices

##### 2.6.3.1 Storage Type Water Heaters and Tanks

All pressurized storage-type water heaters and unfired hot water storage tanks shall be equipped with one or more combination temperature and pressure relief valves. The temperature steam rating of a combination temperature and pressure relief valve or valves shall equal or exceed the energy input rating in BTU per hour of the water heater. No shut off valve or other restricting device may be installed between the water heater or storage tank and the combination temperature and pressure relief valve.

##### 2.6.3.2 Non-Storage Type Water Heaters

All pressurized non-storage type water heaters shall be provided with a pressure relief valve installed at the hot water outlet with no shut off valve between the heater and the relief valve.

##### 2.6.3.3 Temperature and Pressure Relief Valves

Temperature and pressure relief valves shall be installed so that the sensing element of the valve extends into the heater or tank and monitors the temperature in the top 6 inches of the heater or tank.

##### 2.6.3.4 Relief Valve

Every relief valve which is designed to discharge water or steam shall be connected to a discharge pipe. The discharge pipe and fittings shall have a diameter not less than the diameter of the relief valve outlet. The discharge pipe may not be trapped. No valve may be installed in the discharge pipe. The discharge pipe shall be installed to drain by gravity flow to a floor served by a floor drain. The outlet of the discharge pipe shall terminate within 6 inches over the floor or receptor, but not less than a distance equal to twice the diameter of the outlet pipe. The outlet of the discharge pipe may not be threaded. The discharge pipe for a water heater shall terminate within the same room or enclosure within which the water heater or hot water storage tank is located.

##### 2.6.3.5 Safety Devices

Relief valves shall be listed by the American Gas Association, Underwriters Laboratories, Inc. or American Society of Mechanical Engineers when the



heat input to a water heater is less than or equal to 200,000 BTU per hour.

Relief valves shall be listed by the American Society of Mechanical Engineers when the heat input to a water heater exceeds 200,000 BTU per hour. Pressure relief valves shall be set to open at either the maximum allowable working pressure rating of the water heater or storage tank or 150 psig, whichever is smaller. Temperature and pressure relief valves shall be set to open at a maximum of 210 degrees F and in accordance with subpar. f.3).

## 2.7 FIXTURES AND TRIM

This section of the work includes plumbing fixtures furnished and installed by the Contractor.

### 2.7.1 Vitreous China Fixtures

All vitreous china fixtures shall be of the best quality conforming in all respects to classification "Regulation Selection" in accord with the uniform grading rules of "Vitreous China". Fixtures to be "roughed-in" in accord with manufacturer's dimensions. All fixtures shown on the drawings and/or specified herein shall be set firm and true, connected to all the piping services required and ready for use without the offsetting of supplies. Equipment shall be suitably protected against damage before and after installation. Any damaged plumbing fixture or piece of equipment shall be replaced at the expense of the plumbing contractor. All fixtures to be acceptable for final inspection shall be free of chips, flaws, scratches, abrasions, discolorations or any defect which, in the opinion of the Contracting Officer would classify the fixture as unsuitable for use intended.

### 2.7.2 Exposed Trim

All exposed trim including pipe nipples to plumbing fixtures shall be chromium plated and shall be completely free of tool marks, abrasions, or flattening of tubing, etc. All fixtures included in this specification and shown on the drawings shall be completed by the plumbing contractor together with all necessary hangers, bolted, anchors and brackets.

### 2.7.3 Fixture Location

All fixture heights, spacing apart and distances from walls shall be in accordance with Architectural details (floor plans and elevation). Deviation may necessitate alteration to comply with plans. Verify dimensions with General Trades. All fixtures shall be set level.

### 2.7.4 Water Flow

Repair all leaks, dripping faucets, etc. Regulate flow to water closets, showers, etc., for proper operation. Provide shutoffs at all individual fixtures.

### 2.7.5 Fixtures and Trim

Fixtures and trim of equal quality as listed by other manufacturers may be submitted.

### 2.7.6 Fixture Support

Fixture support. Provide and install proper supports and carriers for

plumbing fixtures as scheduled or required for the application. Carriers shall be set in accordance with manufacturer's recommendations with adequate anchors and fasteners to provide required support. Wall hung water closet outlets shall be fully grouted for support in masonry walls.

#### 2.7.7 Caulk

Caulk around all plumbing fixtures.

### 2.8 PLUMBING FIXTURES

#### 2.8.1 WC-1 Water Closet (ADA)

Kohler K-4330, American Standard 2257.103, Crane 3-446E. Vitreous china elongated bowl siphon jet rear outlet water closet with top spud. Rim 18 inches A.F.F. Provide fixture carrier.

##### 2.8.1.1 Flush Valve

Sloan Regal 111 or Sloan Royal, Zurn Z-6000XL-WS1 or Aquavantage, Delany 402-1. Exposed chrome plated flush valve for 1.6 gallon flush, quiet action with screw-driver stop, vacuum breaker, escutcheon and spud flange.

##### 2.8.1.2 Seat

Bemis No. 1955-C, Beneke 523, Kohler K-4670-C, Olsonite 10-CC. Extra heavy white solid plastic open front seat with check hinge for elongated bowl.

##### 2.8.1.3 Grab Bars

##### 2.8.1.4 Carrier

Zurn 1203/1204 Series, Wade, J.R. Smith. No hub, horizontal/vertical, siphon jet carrier. Right or left hand, double/single to be determined by Plumbing Contractor. Note: As per ADA code, flush handle must be located on open accessible side of stall.

#### 2.8.2 WC-2 Water Closet

Kohler K-4330, American Standard 2257.103, Crane 3-446E. Vitreous china elongated bowl siphon jet rear outlet water closet with top spud. Rim 18" A.F.F. Provide fixture carrier.

##### 2.8.2.1 Flush Valve

Sloan Regal 111 or Sloan Royal, Zurn Z-6000XL-WS1 or Aquavantage, Delany 402-1. Exposed chrome plated flush valve for 1.6 gallon flush, quiet action with screw-driver stop, vacuum breaker, escutcheon and spud flange.

##### 2.8.2.2 Seat

Bemis No. 1955-C, Beneke 523, Kohler K-4670-C, Olsonite 10-CC. Extra heavy white solid plastic open front seat with check hinge for elongated bowl.

##### 2.8.2.3 Grab Bars

#### 2.8.2.4 Carrier

Zurn 1203/1204 Series, Wade, J.R. Smith. No hub, horizontal/vertical, siphon jet carrier. Right or left hand, double/single to be determined by Plumbing Contractor. Note: As per ADA code, flush handle must be located on open accessible side of stall.

#### 2.8.3 SS-1 Service Sink

E.L. Mustee 63M, Fiat MSB-2424, Zurn 24. 24 inch x 24 inch x 10 inch deep resin bonded white with black accents one piece mop basin with 3 inch cast brass drain body, dome strainer/lint basket. Provide 3 inch neoprene gasket 3 place mop hanger, vinyl bumper guard and silicone sealant. Provide 12 inch x 24 inch stainless steel wall panels and seal around basin at top of basin and wall panels.

##### 2.8.3.1 Faucet

Zurn Z-841M1, Chicago 897, T&S Brass B-0667-POL, Kohler K-8904. Polished chrome plated brass exposed wall mount service sink faucet with threaded spout, pail hook, wall bracket and loose key or integral stops. Install Watts No. 8A chrome plated vacuum breaker on threaded spout. Provide 36 inch long hose kit. Install faucet at 36 inch AFF.

#### 2.8.4 DF-1 Drinking Fountain

Elkay EDFP-117-C, Halsey-Taylor OVL-II-SEBP, Haws 1114, Oasis MLFMRS�. Two level lead-free, wall mounted, stainless steel fountain with wall plate and safety bubbler.

##### 2.8.4.1 Supply

EBC VA-16, Brass Craft OCR-1412-AZC. 1/2 inch compression chrome plated cast brass angle stop with brass stem, wheel handle and chrome escutcheon.

##### 2.8.4.2 Trap

EBC TA140, McGuire 8902, Keeney 311XPC. Chrome plated 1-1/4 inch x 1-1/2 inch, 17 gauge ground joint "P" trap.

### PART 3 EXECUTION

#### 3.1 Execution

##### 3.1.1 Workmanship

All work shall be done by qualified licensed plumbers that are knowledgeable and experienced in the operations they are performing. Fabrications and installation methods, procedures and materials shall be in accordance with accepted industry practice and with the standard of manufacturing and contracting associations applicable to the work. All work shall be neatly done with special emphasis on the appearance of work exposed to view. All piping shall be run plumb and square unless otherwise required for a functional reason. Gradients of pitched lines shall be continuous.

##### 3.1.2 Painting

Furnish all equipment completely finished unless specifically noted otherwise. Touch up all abrasions, nicks, scratches or other paint defects to restore equipment to its original condition. Severely marred equipment shall be factory refinished if so desired by Contracting Officer. Clean all surfaces to make them suitable for painting, on all equipment furnished, which are to be painted by other.

### 3.1.3 Excavation and Backfill

Refer to Section 02300 EARTHWORK which is applicable; especially note references to "Site Information, Protection, Excavation, Unforeseen Obstacles, Filling and Grading, Compaction Tests, Disposal of Excess and Waste Materials, Dewatering, Etc.

Contractor shall perform all excavation required for related underground piping inside building and for all exterior underground piping. Include all necessary clearing of excavated area, and all trenching, tunneling, sheet piling, shoring, underpinning, pumping, bailing, transportation of earth, fill and backfilling. Reference is made to the Working Drawings for subsurface soil data, contours, site conditions, etc. Excavate whatever material is encountered to depth required. Excavation shall extend one foot out from each side of pipe. Bottom of trench or excavation shall be level and solidly compacted to assure firm foundation. All excavated materials shall be removed from site or deposited as directed by the Contracting Officer. Protect excavation from caving or washing and erect necessary barricades, complying with regulations set forth in EM 385-1-1.

Lay all pipe in open trenches unless Contracting Officer gives written approval for tunneling. Trenches for sewers and water shall have a minimum of 8 feet of space between each service. All underground piping shall be supported on a bedding of sand or granular material at least 4 inches thick. Backfill with sand to one foot above top of piping and thoroughly compacted with earth free of cinders, stones and debris. Remove forms, shoring, etc., as backfill is placed. All backfilling under footings must be compacted within 8 feet of all footings. When running a pipe below a footing and parallel to it, same shall in all cases be at least one foot greater in distance away from footing than below its bottom. Where possible, run lines at center point between two parallel footings and maintain above mentioned distances at minimum. When running under a footing, disturb as little of the soil under footing as possible. Provide concrete fill under all footings where excavations wider than 18 inches are required. Backfilling shall not be placed until the work has been inspected, tested and approved. Concrete, asphalt or gravel paved areas, sidewalks, curb, gutters and lawn areas which are disturbed shall be replaced and restored to original condition by Contractor unless specifically stated to the contrary.

### 3.1.4 Cutting and Patching

Skilled tradesmen shall be employed to do cutting and patching. Each trade shall be responsible for cutting and patching new openings for their use, in existing or previously constructed walls, ceilings, floors, roofs, etc., unless otherwise designated. Provide personnel protection under coring operations in occupied areas. Submit methods of supporting and sealing floor sleeves for approval. Holes cut in roof and exterior wall shall be weatherproofed immediately. Provide temporary dust barriers for cutting operations in occupied spaces. Refer to Architectural drawings for lintels provided by General trades. When lintels are not indicated in other division of the work, they shall be provided by the trade requiring the

opening. All piping penetrations through masonry structure shall be drilled or core drilled. All penetrations for access panels, etc. shall be saw cut before removal. Jack hammering without saw cutting is prohibited.

#### 3.1.5 Access

All plumbing fixtures and/or equipment shall be located so that parts requiring service and/or adjustment, fixture traps and valves shall be readily accessible. Provide access doors or panels to make service convenient. Doors by Milcor or as per architectural specifications.

#### 3.1.6 Equipment and Piping

Below 7 feet-6 inches above finished floor shall have a resilient material (foam rubber, etc.) attached to all potentially dangerous edges.

### 3.2 SLEEVES AND INSERTS

At all fire rated penetrations only use UL listed, tested, and approved materials and methods. All pipes passing through masonry walls, floors, ceilings or partitions shall be provided with sleeves having internal diameters at least 1/4 inch greater than the outside diameter of uninsulated pipes and/or outside diameter of the insulation of insulated piping. Sleeves for pipes passing through fire rated floor slabs and fire rated walls shall be Schedule 40 steel pipe extending 1 inch above the finished slab and sealed. If holes must be cut through finished construction they must be core drilled to avoid damage to construction. Exterior wall sleeves shall be caulked weathertight. Sleeves through equipment room also shall be filled with glass fiber insulation. Where chases are formed for passage of several pipes, they shall have a 1 inch high curb above finished slab and sealed. Whenever sleeves occur as penetrations of rated construction, the void space shall be sealed with U.L. rated foam sealant similar to Chase Foam, CTC PR855; 3M Fire Barrier Caulk CP25 and putty 303; Dow Corning Fire Stop 2000 or Specified Technologies, Inc. Spec Seal Firestop Products installed in strict accordance with the manufacturer's instructions. Use sealant thickness as required to provide the full fire protection rating of the structure. Insulation shall not pass through rated assemblies. Insulation shall butt tight against the rated assembly after the sealant is installed and inspected. Inserts in floor slabs shall be galvanized individual type with accommodation for removable nuts and threaded rods up to 3/4 inch diameter, permitting lateral adjustment. Any fastener in a beam shall be midway above the bottom of the beam. Piping that passes through outside walls below grade and above grade shall be permanently sealed with a water-tight rubber compression seal between the pipe and the sleeve equal to Link-Seal modular wall and casing seal as manufacturer by Thunderline Corporation. The pipe sleeve and seal must meet UL listed, tested, and approved materials and methods.

### 3.3 MOUNTING PADS

Floor mounted mechanical equipment shall be set on reinforced concrete pads 4 inches high and extending 4 inches beyond the equipment base on all sides. See drawings for specific requirements.

### 3.4 IDENTIFICATION

Identify all mechanical equipment with nameplate bearing equipment name and number, using 1-1/2 inch white bakelite with 1/2 inch black letters

permanently mounted in a conspicuous place. Use mechanical fasteners instead of adhesive to mount nameplates wherever possible.

Each piping system furnished and installed shall be identified. The direction of flow shall be identified by means of stenciled legends and flow arrows. The marking shall be applied after all painting and cleaning of the piping and insulation is completed and before ceilings are installed. Marking shall be in accordance with EM 385-1-1 and ASME A 13.1 1996 "Scheme for Identification of Piping Systems".

The legend and flow arrow shall be applied at all valve locations at all points where piping enters or leaves a wall, partition, bulkhead, cluster of piping, or similar obstruction and at approximately 30 foot intervals on pipe runs with at least one in each space or room. Color shall be black with stencils sized as follows: Over 2" - 1" high; 2" under - 1/2" high. The marking shall be located so as to be conspicuous and legible at all times from any reasonable point. Install markings before ceilings are installed.

#### 3.4.1 Valve Identification

Valve charts shall be provided for each piping system which shall identify each valve with a numbered 1-1/4 inch round brass metal tag, stating valve number, valve location and describe valve function. Upon completion of the project, provide two copies of each chart enclosed in a glass front metal frame and shall be mounted in the mechanical room in a place as directed by the Contracting Officer. Tags shall be attached with metal "S" hooks or by metal chain. Tags shall be equal to Seton #2960. Provide valve identification charts in each Government's service and maintenance manual. Identification Symbols as follows:

|     |                     |
|-----|---------------------|
| DCW | Domestic Cold Water |
| DHW | Domestic Hot Water  |

#### 3.4.2 Concealed Valves and Equipment Identification

All valves, controls, or other equipment requiring service located above removable ceilings, shall have the ceiling tile directly below identified with a colored tack inserted into the tile or a colored sticker applied to grid system designating a valve above.

#### 3.5 ESCUTCHEONS

Escutcheons shall be installed on all exposed pipes wherever they pass through floors, ceilings, walls, or partitions. Escutcheons for pipes passing through floors in unfinished areas shall be split hinged type designed to fit the pipe and to cover the projecting pipe sleeve. Escutcheons for pipes exposed to view in finished areas shall be chrome plated brass. Escutcheons shall be properly sized to fit snugly around the pipe and shall be sized to completely cover the wall or floor opening.

#### 3.6 TESTS AND ADJUSTMENTS

The Contractor shall conduct tests of systems as required by codes, regulatory agencies and this specification. Tests shall be made with the medium and under pressure as stated in the test requirements. Notify the Contracting Officer and/or regulatory agencies prior to conducting tests. The Contractor shall complete the attached certification form and submit to the Contracting Officer when tests have been completed and include in O&M Manuals.

### 3.6.1 Tests

| Type of System  | Gauge Pressures  | Test Medium |
|---|--|-------------|
|   | (lbs. per sq. inch, or vacuum in inches)   |             |
| Building Sewers, Building Drains, All Branches, Vents and Stacks of Sanitary, Storm or Clear Water Piping Systems | Minimum of 10 foot head on each joint for a minimum of 15 minutes with no head loss. | Water       |
|   | Uniform gauge pressure of 3 psi for a minimum of 15 minutes without adding air.      | Air         |
| Water   |  |             |
| a) Service and Bldg. Distribution Piping.   | 100 psi gauge pressure for a 2 hour period   | Water       |

(1) The pressure in pounds per square inch, or inches of vacuum, gauge, are given as an initial pressure to be applied to lines being tested, together with test medium. Tests are to be applied for a minimum period of 4 hours and until tests are complete. Final pressures at the end of test period may vary only by that caused by expansion of the test medium due to temperature changes.

(2) Check of systems during application of test pressures should include visual check for water medium leakage, soap bubble or similar for air and nitrogen medium.

#### 3.6.1.1 Start Up of Piping Systems

Potable water system shall be cleaned and disinfected in accordance with state and local codes or in the absence of such codes shall be treated by accepted methods to provide a system free of harmful contaminants and acceptance to regulatory agencies. All lines shall be thoroughly flushed to remove dirt and construction debris.

### 3.7 REQUIREMENTS FOR SUBSTANTIAL COMPLETION

#### 3.7.1 Cleaning Equipment and Premises

Thoroughly clean all parts of the piping, valves and fixtures. Exposed parts which are to be painted shall be thoroughly cleaned of cement, plaster and other materials and all oil and grease spots removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean. Remove all construction debris, excess materials and equipment. Caulk around all plumbing fixtures at walls and around base of water closets, service sinks, etc.

#### 3.7.2 Operating and Maintenance Manuals

##### 3.7.2.1 Manuals

The Contractor shall furnish to the Contracting Officer five operating manuals for furnished equipment. Information sheets shall be bound in standard 3-ring binders labeled to show the contractor's name, address, regular business phone number, emergency phone number and date. Operating manuals shall be submitted prior to completion of the work to allow time for review. The manual shall contain the following information:

- a. The Certification of Tests and Adjustments completed and signed.
- b. A list (keyed with identification numbers used) of each item of equipment, which required service giving the name of the item, model number, manufacturer's name and address and the name address and phone number of the nearest representative or authorized service organization.
- c. A copy of the approved shop drawing for each item.
- d. A complete operating and maintenance manual with parts listed, wiring diagrams, lubrication requirements, and service instructions for each major item including faucet and mixing valve repair.
- e. Complete control diagrams with description of all operating sequences and control devices.
- f. Properly executed and registered manufacturer's warranties.
- g. A copy of valve chart.

#### 3.7.2.2 Training

Provide a minimum of 2 hours training on operations of major equipment with Government maintenance staff. Contractor shall provide training on the proper methods of winterizing a seasonal building.

#### 3.8 PENETRATIONS OF FIRE RESISTIVE ASSEMBLIES

Plumbing piping systems that penetrate fire rated assemblies shall be installed in accordance with current North Dakota Plumbing and HVAC Code and U.L. or current acceptable methods. Also refer to requirements for sleeves.

#### 3.9 ATTACHMENTS

- (1) Certification of Tests and Adjustments - Plumbing

-- End of Section --



CERTIFICATION OF TESTS AND ADJUSTMENTS - PLUMBING

Plumbing Trade Name:

Project Name

Project Number

The Plumbing Trade named above certifies that the tests and adjustments indicated below have been completed in accordance with the specifications on the date indicated.

| TESTS   | DATE  |
|---|-------|
| Building Sewers, Building Drains, Branches, Vents and Stacks      | _____ |
| Sanitary Waste and Vent   | _____ |
| Water:  |       |
| 1) Building Service   | _____ |
| 2) Building Distribution  | _____ |
| Start-up of Piping System and Pumps                               | _____ |
| Flushing and Disinfection of Potable Water System                 | _____ |
| Training Government on Methods of Winterizing a Seasonal Building | _____ |

Contract \_\_\_\_\_

Signed By Plumbing Contractor \_\_\_\_\_

Date \_\_\_\_\_

Signed By Project Manager \_\_\_\_\_

Date \_\_\_\_\_

SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15500

HEATING, VENTILATION, AND AIR-CONDITIONING SYSTEMS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 GENERAL REQUIREMENTS
  - 1.3.1 Verification of Dimensions
  - 1.3.2 Drawings
- 1.4 DELIVERY AND STORAGE
- 1.5 OPERATION MANUAL
- 1.6 MAINTENANCE AND REPAIR MANUAL

PART 2 PRODUCTS

- 2.1 MATERIAL AND EQUIPMENT
- 2.2 GENERAL EQUIPMENT REQUIREMENTS
  - 2.2.1 Electrical and Electronic Devices
  - 2.2.2 Standard Signals
  - 2.2.3 Ambient Temperature Limits
  - 2.2.4 Nameplates, Lens Caps, and Tag Nameplates
  - 2.2.5 Year 2000 Compliance
- 2.3 MATERIALS
  - 2.3.1 Wiring
    - 2.3.1.1 Terminal Blocks
    - 2.3.1.2 Control Wiring for 24-Volt Circuits
    - 2.3.1.3 Wiring for 120-Volt Circuits
    - 2.3.1.4 Analog Signal Wiring Circuits
    - 2.3.1.5 Instrumentation Cable
    - 2.3.1.6 Nonconducting Wiring Duct
    - 2.3.1.7 Transformers
- 2.4 ACTUATORS
- 2.5 DAMPERS
  - 2.5.1 Damper Assembly
    - 2.5.1.1 Operating Links
    - 2.5.1.2 Damper Types
  - 2.5.2 Outside-Air and Exhaust-Air Dampers
  - 2.5.3 Mechanical Space Ventilation Dampers
- 2.6 THERMOSTATS
  - 2.6.1 Nonmodulating Room Thermostats
  - 2.6.2 Modulating Room Thermostats
- 2.7 CONTROL DEVICES AND ACCESSORIES
  - 2.7.1 Function Modules
    - 2.7.1.1 Minimum-Position Switch and Temperature-Setpoint Device
  - 2.7.2 Relays
  - 2.7.3 Time-Delay Relays
- 2.8 DUCTWORK COMPONENTS
  - 2.8.1 Metal Ductwork

- 2.8.1.1 Transitions
- 2.8.1.2 Metallic Flexible Duct
- 2.8.1.3 General Service Duct Connectors
- 2.8.2 Ductwork Accessories
  - 2.8.2.1 Duct Access Doors
- 2.8.3 Duct Sleeves, Framed Prepared Openings, Closure Collars
  - 2.8.3.1 Duct Sleeves
  - 2.8.3.2 Framed Prepared Openings
  - 2.8.3.3 Closure Collars
- 2.8.4 Louvers
- 2.8.5 Bird Screens and Frames
- 2.9 AIR SYSTEMS EQUIPMENT
  - 2.9.1 Tube Axial Blower
    - 2.9.1.1 Panel Type Power Wall Ventilators (EF-1 and EF-2)
  - 2.9.2 Fans
    - 2.9.2.1 General
    - 2.9.2.2 In-Line Centrifugal Fans (EF-3)
    - 2.9.2.3 Power Roof Ventilators
- 2.10 FACTORY PAINTING
- 2.11 UNIT HEATERS
  - 2.11.1 Propeller Fan Heaters
  - 2.11.2 Motors
  - 2.11.3 Motor Switches

### PART 3 EXECUTION

- 3.1 GENERAL INSTALLATION CRITERIA
  - 3.1.1 Device Mounting Criteria
  - 3.1.2 Wiring Criteria
  - 3.1.3 Access Panels
  - 3.1.4 Flexible Connectors
  - 3.1.5 Sleeved and Framed Openings
  - 3.1.6 Metal Ductwork
  - 3.1.7 Insulation
  - 3.1.8 Power Transmission Components Adjustment
- 3.2 DUCTWORK LEAK TEST
- 3.3 CONTROL SYSTEM INSTALLATION
  - 3.3.1 Damper Actuators
  - 3.3.2 Room-Instrument Mounting
- 3.4 CONTROL SEQUENCES OF OPERATION
  - 3.4.1 System Requirements
  - 3.4.2 Electric Unit-Heaters (EUH-1 and EUH-2)
  - 3.4.3 Exhaust Fan: EF-1 (Operating Floor)
  - 3.4.4 Exhaust Fan: EF-2 (Sump Floor)
  - 3.4.5 Emergency Generator Damper Sequences
- 3.5 COMMISSIONING PROCEDURES
  - 3.5.1 General Procedures
    - 3.5.1.1 Evaluations
    - 3.5.1.2 Item Check
    - 3.5.1.3 Configuration
  - 3.5.2 Unit Heater
- 3.6 BALANCING, COMMISSIONING, AND TESTING
  - 3.6.1 Coordination with HVAC System Balancing
  - 3.6.2 Control System Calibration, Adjustments, and Commissioning
  - 3.6.3 Performance Verification Test
  - 3.6.4 Posted and Panel Instructions
- 3.7 TRAINING
  - 3.7.1 Training-Course Requirements
  - 3.7.2 Training-Course Content

-- End of Section Table of Contents --

SECTION 15500

HEATING, VENTILATION, AND AIR-CONDITIONING SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ANTI-FRICTION BEARING MANUFACTURERS ASSOCIATION (AFBMA)

AFBMA Std 9 (1990) Load Ratings and Fatigue Life for Ball Bearings

AFBMA Std 11 (1990) Load Ratings and Fatigue Life for Roller Bearings

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMCA 210 (1985) Laboratory Methods of Testing Fans for Rating

AMCA 300 (1996) Reverberant Room Method for Sound Testing of Fans

AMCA 500-D (1997) Laboratory Methods of Testing Dampers for Rating

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 68 (1986) Laboratory Method of Testing In-Duct Sound Power Measurement Procedures for Fans

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53 (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 123/A 123M (2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 924/A 924M (1999) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM B 117 (1997) Operating Salt Spray (Fog) Apparatus

ASTM D 520 (1984; R 1995e1) Zinc Dust Pigment

## Grand Forks Phase 2 Levees

|             |  |
|-------------|--|
| ASTM D 1654 | (1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments |
| ASTM D 3359 | (1997) Measuring Adhesion by Tape Test   |
| ASTM E 437  | (1997) Industrial Wire Cloth and Screens (Square Opening Series)                     |

### NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

|          |   |
|----------|---|
| NEMA 250 | (1997) Enclosures for Electrical Equipment (1000 Volts Maximum) |
|----------|---|

### SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

|                             |  |
|-----------------------------|--|
| SMACNA HVAC Duct Const Stds | (1995; Addenda Nov 1997) HVAC Duct Construction Standards - Metal and Flexible |
| SMACNA Leakage Test Mnl     | (1985) HVAC Air Duct Leakage Test Manual                                       |

### UNDERWRITERS LABORATORIES (UL)

|                |  |
|----------------|--|
| UL 181         | (1996; Rev Dec 1998) Factory-Made Air Ducts and Air Connectors |
| UL 214         | (1997) Tests for Flame-Propagation of Fabrics and Films        |
| UL 508         | (1999) Industrial Control Equipmen                             |
| UL Bld Mat Dir | (1999) Building Materials Director                             |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

HVAC Control System; GA  
Service Organizations; FIO

Six copies of a list of service organizations qualified to service the HVAC control system. The list shall include the service organization name, address, technical point of contact and telephone number, and contractual point of contact and telephone number.

Equipment Compliance Booklet; FIO

An HVAC control system equipment compliance booklet (ECB) in indexed booklet form with numbered tabs separating the information on each device. It shall consist of, but not be limited to, data sheets and catalog cuts which document compliance of all devices and components with the specifications. The ECB shall be indexed in alphabetical order by the unique identifiers. Devices and

components which do not have unique identifiers shall follow the devices and components with unique identifiers and shall be indexed in alphabetical order according to their functional name. The ECB shall include a bill of materials for each HVAC control system. The bill of materials shall function as the table of contents for the ECB and shall include the device's unique identifier, device function, manufacturer, model/part/catalog number used for ordering, and tab number where the device information is located in the ECB.

#### Commissioning Procedures; GA

a. Six copies of the HVAC control system commissioning procedures, in indexed booklet form, 60 days prior to the scheduled start of commissioning. Commissioning procedures shall be provided for each HVAC control system, and for each type of terminal-unit control system. The commissioning procedures shall reflect the format and language of this specification, and refer to devices by their unique identifiers as shown. The commissioning procedures shall be specific for each HVAC system, and shall give detailed step-by-step procedures for commissioning of the system.

#### Performance Verification Test Procedures; FIO

Six copies of the HVAC control system performance verification test procedures, in indexed booklet form, 60 days before the Contractor's scheduled test dates. The performance verification test procedures shall refer to the devices by their unique identifiers as shown, shall explain, step-by-step, the actions and expected results that will demonstrate that the HVAC control system performs in accordance with the sequences of operation. An HVAC control system performance verification test equipment list shall be included that lists the equipment to be used during performance verification testing. The list shall include manufacturer name, model number, equipment function, the date of the latest calibration, and the results of the latest calibration.

#### Training Course Requirements; FIO

Six copies of HVAC control system training course material 30 days prior to the scheduled start of the training course. The training course material shall include the operation manual, maintenance and repair manual, and paper copies of overheads used in the course. An HVAC control system training course, in outline form, with a proposed time schedule. Approval of the planned training schedule shall be obtained from the Government at least 60 days prior to the start of the training.

#### SD-04 Drawings

##### Drawings; GA

Drawings on A1 34 by 22 inch sheets in the form and arrangement shown. The drawings shall use the same abbreviations, symbols, nomenclature and device identifiers shown. Each control-system element on a drawing shall have a unique identifier as shown. All HVAC control system drawings shall be delivered together as a complete submittal. Drawings shall be submitted for each HVAC

system.

- a. HVAC control system drawings shall include the following:

Sheet One: Drawing index, HVAC control system legend.

Sheet Two: damper schedule.

Sheet Three: HVAC control system schematic and equipment schedule.

Sheet Four: HVAC control system sequence of operation and ladder diagram.

Sheet Five: Motor starter and relay wiring diagram.

- b. An HVAC control system drawing index showing the name and number of the building, military site, State or other similar designation, and Country. The drawing index shall list all HVAC control system drawings, including the drawing number, sheet number, drawing title, and computer filename when used.

- c. A damper schedule showing each damper and actuator's identifier, nominal and actual sizes, orientation of axis and frame, direction of blade rotation, spring ranges, operation rate, positive positioner ranges, locations of actuators and damper end switches, arrangement of sections in multi-section dampers, and methods of connecting dampers, actuators, and linkages. The damper schedule shall include the maximum leakage rate at the operating static-pressure differential. The damper schedule shall contain actuator selection data supported by calculations of the torque required to move and seal the dampers, access and clearance requirements.

- d. An HVAC control system equipment schedule showing the device unique identifier, device function, setpoint, input range, and additional important parameters (i.e. output range).

- e. An HVAC control system sequence of operation.

- f. An HVAC control system ladder diagram showing all relays, contacts, pilot lights, switches, fuses and starters connected to the control system.

- g. HVAC control system wiring diagrams showing functional wiring diagrams of the interconnection of conductors and cables to HVAC control panel terminal blocks and to the identified terminals of devices, starters and package equipment. The wiring diagrams shall show all necessary jumpers and ground connections. The wiring diagrams shall show the labels of all conductors. Sources of power required for HVAC control systems and for packaged-equipment control systems shall be identified back to the panel-board circuit breaker number, HVAC system control panel, magnetic starter, or packaged equipment control circuit. Each power supply and transformer not integral to a controller, starter, or packaged equipment shall be shown. The connected volt-ampere load and the power supply volt-ampere rating shall be shown.



SD-09 Reports

Commissioning Report; FIO

Six copies of the HVAC control system commissioning report, in indexed booklet form, within 30 days after completion of the system commissioning. The commissioning report shall include data collected during the HVAC control system commissioning and shall follow the format of the commissioning procedures. The commissioning report shall include all controller and time clock checksheets with final values listed for all parameters, setpoints, P, I, D setting constants, calibration data for all devices, and results of adjustments.

Performance Verification Test; FIO

Six copies of the HVAC control system performance verification test report, in indexed booklet form, within 30 days after completion of the test. The HVAC control system performance verification test report shall include data collected during the HVAC control system performance verification test. The original copies of data gathered during the performance verification test shall be turned over to the Government after Government approval of the test results.

SD-19 Operation and Maintenance Manuals

Operation Manual; GA  
Maintenance and Repair Manual; FIO

Six copies of the HVAC control system operation manual and HVAC control system maintenance and repair manual for each HVAC control system 30 days before the date scheduled for the training course.

1.3 GENERAL REQUIREMENTS

1.3.1 Verification of Dimensions

The Contractor shall become familiar with all details of the work, shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

1.3.2 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall investigate the mechanical, electrical, and finish conditions that could affect the work to be performed, shall arrange such work accordingly, and shall furnish all work necessary to meet such conditions.

1.4 DELIVERY AND STORAGE

Products shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, and other contaminants, within the storage-condition limits published by the equipment manufacturer. Dampers shall be stored so that seal integrity, blade alignment and frame alignment are maintained.

## 1.5 OPERATION MANUAL

An HVAC control system operation manual for each HVAC control system, in indexed booklet form, shall be provided. The operation manual shall include the HVAC control system sequence of operation, and procedures for the HVAC system start-up, operation and shut-down. The operation manual shall include as-built HVAC control system detail drawings. The operation manual shall include the as-built controller configuration checksheets, the as-built time clock configuration checksheet, the HVAC control system front panel description, the procedures for changing HVAC system controller setpoints, the procedures for gaining manual control of processes, the time clock manufacturer's manual control of processes, the time clock manufacturer's operation manual, and the controller manufacturer's operation manual.

- a. The HVAC control system front panel description shall explain the meaning and use of the lights, switches, gauges, and controller displays located in the front panel. Each light, switch, gauge, and display described shall be numbered and referenced to a drawing of the front panel.
- b. The procedures for changing HVAC system controller setpoints shall describe the step-by-step procedures required to change: the process variable setpoints of controllers, the alarm setpoints of controllers, the controller bias settings, and controller setpoint reset schedules.
- c. The procedures for gaining manual control of processes shall describe step-by-step procedures required to gain manual control of devices and manually adjust their positions.

## 1.6 MAINTENANCE AND REPAIR MANUAL

An HVAC control system maintenance and repair manual for each HVAC control system, in indexed booklet form in hardback binders, shall be provided. The maintenance and repair manual shall include the routine maintenance checklist, a recommended repair methods list, a list of recommended maintenance and repair tools, the qualified service organization list, the as-built commissioning procedures and report, the as-built performance verification test procedures and report, and the as-built equipment data booklet (EDB).

- a. The routine maintenance checklist shall be arranged in a columnar format. The first column shall list all devices listed in the equipment compliance booklet (ECB), the second column shall state the maintenance activity or state no maintenance required, the third column shall state the frequency of the maintenance activity, and the fourth column for additional comments or reference.
- b. The recommended repair methods list shall be arranged in a columnar format and shall list all devices in the equipment compliance booklet (ECB) and state the guidance on recommended repair methods, either field repair, factory repair, or whole-item replacement.
- c. The as-built equipment data booklet (EDB) shall include the equipment compliance booklet (ECB) and all manufacturer supplied user manuals and information.

- d. If the operation manual and the maintenance and repair manual are provided in a common volume, they shall be clearly differentiated and separately indexed.

## PART 2 PRODUCTS

### 2.1 MATERIAL AND EQUIPMENT

Material and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products which are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience must be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. The equipment items shall be supported by a service organization. The Contractor shall submit a certified list of qualified permanent service organizations and qualifications. These service organizations shall be reasonably convenient to the equipment on a regular and emergency basis during the warranty period.

### 2.2 GENERAL EQUIPMENT REQUIREMENTS

#### 2.2.1 Electrical and Electronic Devices

All electrical, electronic, and electro-pneumatic devices not located within an HVAC control panel shall have a NEMA Type 12 enclosure in accordance with NEMA 250 unless otherwise shown.

#### 2.2.2 Standard Signals

The output of all analog transmitters and the analog input and output of all single-loop controllers and function modules shall be 4-to-20 mA dc signals. The signal shall originate from current-sourcing devices and shall be received by current-sinking devices.

#### 2.2.3 Ambient Temperature Limits

Ambient Temperature Actuators and positive positioners, and transmitters shall operate within temperature limit ratings of 40 to 140 degrees F. All panel-mounted instruments shall operate within limit ratings of 35 to 120 degrees F and 10 percent to 95 percent relative humidity, noncondensing. All devices installed outdoors shall operate within limit ratings of minus 40 to plus 150 degrees F.

#### 2.2.4 Nameplates, Lens Caps, and Tag Nameplates

Nameplates, lens caps, and lens caps bearing legends as shown and tags bearing device-unique identifiers as shown shall have engraved or stamped characters. A plastic or metal tag shall be mechanically attached directly to each device or attached by a metal chain or wire. Each air flow measurement station shall have a tag showing flow rate range for signal output range, duct size, and identifier as shown.

#### 2.2.5 Year 2000 Compliance

All equipment shall be Year 2000 compliant and shall be able to accurately process date/time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, including leap year calculations, when used in accordance with the product documentation provided by the contractor, provided that all products (e.g. hardware, software, firmware) used in combination with other information technology, shall accurately process date/time data if other information technology properly exchanges date/time data with it.

### 2.3 MATERIALS

#### 2.3.1 Wiring

##### 2.3.1.1 Terminal Blocks

Terminal blocks shall be insulated, modular, feed-through, clamp style with recessed captive screw-type clamping mechanism, shall be suitable for rail mounting, and shall have end plates and partition plates for separation or shall have enclosed sides.

##### 2.3.1.2 Control Wiring for 24-Volt Circuits

Control wiring for 24-volt circuits shall be 18 AWG minimum, stranded copper and shall be rated for 300-volt service.

##### 2.3.1.3 Wiring for 120-Volt Circuits

Wiring for 120-volt circuits shall be 18 AWG minimum, stranded copper and shall be rated for 600-volt service.

##### 2.3.1.4 Analog Signal Wiring Circuits

Analog signal wiring circuits within control panels shall not be less than 20 AWG and shall be rated for 300-volt service.

##### 2.3.1.5 Instrumentation Cable

Instrumentation cable shall be 18 AWG, stranded copper, single or multiple-twisted, minimum 2 inch lay of twist, 100 percent shielded pairs, and shall have a 300-volt insulation. Each pair shall have a 20 AWG tinned-copper drain wire and individual overall pair insulation. Cables shall have an overall aluminum-polyester or tinned-copper cable-shield tape, overall 20 AWG tinned-copper cable drain wire, and overall cable insulation.

##### 2.3.1.6 Nonconducting Wiring Duct

Nonconducting wiring duct in control panels shall have wiring duct in control panels shall have slotted sides, snap-on duct covers, have slotted sides, snap-on duct covers, fittings for connecting ducts, mounting clips for securing ducts, and wire-retaining clips.

##### 2.3.1.7 Transformers

Step-down transformers shall be utilized where control equipment operates

at lower than line circuit voltage. Transformers, other than transformers in bridge circuits, shall have primaries wound for the voltage available and secondaries wound for the correct control circuit voltage. Transformers shall be sized so that the connected load is 80 percent of the rated capacity or less. Transformers shall conform to UL 508.

## 2.4 ACTUATORS

Actuators shall be electric as shown and shall be provided with mounting and connecting hardware. Actuators shall fail to their spring-return positions on signal or power failure. The actuator stroke shall be limited in the direction of power stroke by an adjustable stop. Actuators shall have a visible position indicator. Actuators shall smoothly open or close the devices to which they are applied and shall have a full stroke response time of 90 seconds or less. Electric actuators shall have an oil-immersed gear train. Electric actuators operating in series shall have an auxiliary actuator driver. Electric actuators used in sequencing applications shall have an adjustable operating range and start point.

## 2.5 DAMPERS

### 2.5.1 Damper Assembly

Maximum damper blade width shall be 8 inches. Dampers shall be steel, or other materials where shown. Flat blades shall be made rigid by folding the edges. All blade-operating linkages shall be within the frame so that blade-connecting devices within the same damper section will not be located directly in the air stream. Damper axles shall be 0.5 inch (minimum) plated steel rods supported in the damper frame by stainless steel or bronze bearings. Blades mounted vertically shall be supported by thrust bearings.

Pressure drop through dampers shall not exceed 0.04 inch water gauge at 1,000 fpm in the wide-open position. Frames shall not be less than 2 inches in width. Dampers shall be tested in accordance with AMCA 500-D.

#### 2.5.1.1 Operating Links

Operating links external to dampers (such as crankarms, connecting rods, and line shafting for transmitting motion from damper actuators to dampers) shall withstand a load equal to at least twice the maximum required damper-operating force. Rod lengths shall be adjustable. Links shall be brass, bronze, zinc-coated steel, or stainless steel. Working parts of joints and clevises shall be brass, bronze, or stainless steel. Adjustments of crankarms shall control the open and closed positions of dampers.

#### 2.5.1.2 Damper Types

Dampers shall be parallel blade type.

### 2.5.2 Outside-Air and Exhaust-Air Dampers

The dampers shall be provided where shown. Blades shall have interlocking edges and shall be provided with compressible seals at points of contact. The channel frames of the dampers shall be provided with jamb seals to minimize air leakage. Dampers shall not leak in excess of 20 cfm per square foot at 4 inches water gaugestatic pressure when closed. Seals shall be suitable for an operating temperature range of minus 40 to plus 200 degrees F. Dampers shall be rated at not less than 2000 fpm air velocity. Dampers shall be sized according to damper schedule on drawings.

### 2.5.3 Mechanical Space Ventilation Dampers

The dampers shall be as shown. Dampers shall not leak in excess of 80 cfm per square foot at 4 inches water (gauge) static pressure when closed. Dampers shall be rated at not less than 1500 fpm air velocity.

## 2.6 THERMOSTATS

Thermostat ranges shall be selected so that the setpoint is adjustable without tools between plus or minus 10 degrees F of the setpoint shown. Thermostats shall be electronic or electric.

### 2.6.1 Nonmodulating Room Thermostats

Contacts shall be single-pole double-throw (SPDT), hermetically sealed, and wired to identified terminals. Maximum differential shall be 5 degrees F. Room thermostats shall be enclosed with separate locking covers (guards). Thermostats shall have manual switches as required by the application.

### 2.6.2 Modulating Room Thermostats

Modulating room thermostats shall have two output signals operating in unison, as required for the application. Each thermostat shall have an adjustable throttling range of 4 to 8 degrees F for each output. Room thermostats shall be enclosed with separate locking covers (guards).

## 2.7 CONTROL DEVICES AND ACCESSORIES

Control device and accessory input impedance shall not exceed 250 ohms.

### 2.7.1 Function Modules

Function modules shall accept mAdc analog input signals to produce mAdc analog output signals or contact output signals. Modules shall have zero and span adjustments for analog outputs, and setpoint adjustments for contact outputs. Module output span accuracy shall be plus or minus 1 percent of input span. Modules shall be rail-mounted as shown. Power consumption shall be not greater than 5 watts.

#### 2.7.1.1 Minimum-Position Switch and Temperature-Setpoint Device

Minimum-position switch and temperature-setpoint device shall accept a 1000 ohms potentiometer input and shall produce a steady analog output. In temperature setpoint applications the potentiometer shall be single-turn, suitable for wall mounting, enclosed in a locking metal or heavy duty plastic enclosure and shall have a graduated dial corresponding to the range of the setpoint adjustment. In a minimum position switch application the potentiometer shall be mounted on or internal to the minimum position switch. The device shall have its input signal electrically or optically isolated from output. Mounting socket shall be an 8 pin base with pins 1, 2, 3 ac power input, 4, 5, 6 input signal, 7, 8, output signal.

### 2.7.2 Relays

Relays shall be 2-pole, double-throw (2PDT) with a 10-ampere resistive rating at 120 Vac, and shall have an enclosed 120-Vac coil with 8 pin blade connectors, and a matching rail-mounted socket. Power consumption shall not be greater than 3 watts.

### 2.7.3 Time-Delay Relays

Time delay relays shall be 2PDT with 8 pin connectors, dust cover, and a matching rail-mounted socket. Adjustable timing range shall be 0 to 5 minutes. Power consumption shall be not greater than 3 watts.

## 2.8 DUCTWORK COMPONENTS

### 2.8.1 Metal Ductwork

All aspects of metal ductwork construction, including all fittings and components, shall comply with SMACNA HVAC Duct Const Stds unless otherwise specified. Elbows shall be radius type with a centerline radius of 1-1/2 times the width or diameter of the duct where space permits. Otherwise, elbows having a minimum radius equal to the width or diameter of the duct or square elbows with factory fabricated turning vanes may be used. Static pressure Class 1/2, 1, and 2 inch w.g. ductwork shall meet the requirements of Seal Class C. Class 3 through 10 inch shall meet the requirements of Seal Class A. Sealants shall conform to fire hazard classification specified in Section 15250 MECHANICAL INSULATION. Pressure sensitive tape shall not be used as a sealant. Spiral lock seam duct, and flat oval shall be made with duct sealant and locked with not less than 3 equally spaced drive screws or other approved methods indicated in SMACNA HVAC Duct Const Stds. The sealant shall be applied to the exposed male part of the fitting collar so that the sealer will be on the inside of the joint and fully protected by the metal of the duct fitting. One brush coat of the sealant shall be applied over the outside of the joint to at least 2 inch band width covering all screw heads and joint gap. Dents in the male portion of the slip fitting collar will not be acceptable. Outdoor air intake ducts and plenums shall be fabricated with watertight soldered or brazed joints and seams.

#### 2.8.1.1 Transitions

Diverging air flow transitions shall be made with each side pitched out a maximum of 15 degrees, for an included angle of 30 degrees. Transitions for converging air flow shall be made with each side pitched in a maximum of 30 degrees, for an included angle of 60 degrees, or shall be as indicated. Factory-fabricated reducing fittings for systems using round duct sections when formed to the shape of the ASME short flow nozzle, need not comply with the maximum angles specified.

#### 2.8.1.2 Metallic Flexible Duct

Metallic type duct shall be single-ply two-ply aluminum, self supporting to 8 foot spans. Duct shall be of corrugated/interlocked, folded and knurled type seam construction, bendable without damage through 180 degrees with a throat radius equal to 1/2 duct diameter. Duct shall conform to UL 181 and shall be rated for positive or negative working pressure of 15 inches water gauge at 350 degrees F when duct is aluminum.

#### 2.8.1.3 General Service Duct Connectors

A flexible duct connector approximately 6 inches in width shall be provided where sheet metal connections are made to engine-generator radiator, operating floor exhaust fan, and sump area exhaust fan or where ducts of dissimilar metals are connected. For rectangular ducts, the flexible material locked to metal collars shall be installed using normal duct

construction methods. The composite connector system shall comply with UL 214 and be classified as "flame-retarded fabrics" in UL Bld Mat Dir.

## 2.8.2 Ductwork Accessories

### 2.8.2.1 Duct Access Doors

Access doors shall be provided in ductwork and plenums where indicated and at all air flow measuring primaries, automatic dampers, fire dampers, coils, thermostats, and other apparatus requiring service and inspection in the duct system, and unless otherwise shown, shall conform to SMACNA HVAC Duct Const Stds. Access doors shall be provided upstream and downstream of air flow measuring primaries and heating and cooling coils. Doors shall be minimum 15 x 18 inches, unless otherwise shown. Where duct size will not accommodate this size door, the doors shall be made as large as practicable. Doors 24 x 24 inches or larger shall be provided with fasteners operable from both sides. Doors in insulated ducts shall be the insulated type.

### 2.8.3 Duct Sleeves, Framed Prepared Openings, Closure Collars

#### 2.8.3.1 Duct Sleeves

Duct sleeves shall be provided for round ducts 15 inches in diameter or less passing through floors, walls, ceilings, or roof, and installed during construction of the floor, wall, ceiling, or roof. Round ducts larger than 15 inches in diameter and square, rectangular, and oval ducts passing through floors, walls, ceilings, or roof shall be installed through framed prepared openings. The Contractor shall be responsible for the proper size and location of sleeves and prepared openings. Sleeves and framed openings are also required where grilles, registers, and diffusers are installed at the openings. Framed prepared openings shall be fabricated from 20 gauge galvanized steel, unless otherwise indicated. Where sleeves are installed in bearing walls or partitions, black steel pipe, ASTM A 53, Schedule 20 shall be used. Sleeve shall provide 1 inch clearance between the duct and the sleeve or 1 inch clearance between the insulation and the sleeve for insulated ducts.

#### 2.8.3.2 Framed Prepared Openings

Openings shall have 1 inch clearance between the duct and the opening or 1 inch clearance between the insulation and the opening for insulated ducts.

#### 2.8.3.3 Closure Collars

Collars shall be fabricated of galvanized sheet metal not less than 4 inches wide, unless otherwise indicated, and shall be installed on exposed ducts on each side of walls or floors where sleeves or prepared openings are provided. Collars shall be installed tight against surfaces. Collars shall fit snugly around the duct or insulation. Sharp edges of the collar around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier. Collars for round ducts 15 inches in diameter or less shall be fabricated from 20 gauge galvanized steel. Collars for round ducts larger than 15 inches and square, and rectangular ducts shall be fabricated from 18 gauge galvanized steel. Collars shall be installed with fasteners on maximum 6 inch centers, except that not less than 4 fasteners shall be used.

#### 2.8.4 Louvers



Louvers for installation in exterior walls which are associated with the air supply and distribution system shall be as specified in Section 07600 SHEET METALWORK, GENERAL.

#### 2.8.5 Bird Screens and Frames

Bird screens shall conform to ASTM E 437, No. 2 mesh, aluminum stainless steel. Aluminum screens shall be rated "medium-light". Stainless steel screens shall be rated "light". Frames shall be removable type, or stainless steel or extruded aluminum.

### 2.9 AIR SYSTEMS EQUIPMENT

#### 2.9.1 Tube Axial Blower

Provide 1 tube axial blower for the entire project. Blower shall use 480volt/3-phase/60 hz power with a totally enclosed manual starter. Unit shall provide a minimum of 5,500 cfm free air delivery using a 2 horsepower, 3,500 rpm motor. Blower construction shall include heavy gauge steel housing with epoxy powder coating, skid mounting, inlet and outlet screens to meet OSHA standards and beaded connections at inlet and outlet for ductwork connection. Provide a minimum 8 foot power cord, 12/3 with ground, extra hard usage, type S.O., flexible cable with plug. Plug shall be L16-20P configuration, and connected to cord end. Provide one, 25-foot long, 16-inch diameter flexible duct for connection to either end of blower. Blower design and construction shall be similar to Copps Model TA-16 Tube Axial Blower.

##### 2.9.1.1 Panel Type Power Wall Ventilators (EF-1 and EF-2)

Fans shall be propeller type, assembled on a reinforced metal panel with venturi opening spun into panel. Fans with wheels less than 24 inches diameter shall be direct or V-belt driven and fans with wheels 24 inches diameter and larger shall be V-belt drive type. Fans shall be furnished with wall mounting collar. Lubricated bearings shall be provided. Fans shall be fitted with wheel and motor side metal or wire guards which have a corrosion-resistant finish. Motor enclosure shall be totally enclosed fan cooled type. Heavy-duty, motorized backdraft dampers shall be provided for both operating floor exhaust fans and sump area exhaust fan. Fans shall be sized according to fan schedule on drawings.

#### 2.9.2 Fans

##### 2.9.2.1 General

Roof exhaust fans shall be provided with combination motor starter and disconnect mounted on the frame of the fan. Fans shall be tested and rated in accordance with AMCA 210, AMCA 300 and ASHRAE 68. Fans shall be connected to the motors either directly or indirectly with V-belt drive as specified below or as scheduled on the drawings. V-belt drives shall be designed for not less than 150 percent of the connected driving capacity and motor sheaves shall be adjustable to provide not less than 20 percent fan speed variation. Sheaves shall drive the fan at such speed as to produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Motors for V-belt drives shall be provided with adjustable rails or bases. Removable metal guards shall be provided for all exposed V-belt drives, and speed-test openings shall be provided at the center of all rotating shafts. Fans shall be provided with personnel

screens or guards on both suction and supply ends, except that the screens need not be provided, unless otherwise indicated, where ducts are connected to the fan. Fan and motor assemblies shall be provided with vibration-isolation supports or mountings. Vibration-isolation units shall be standard products with published loading ratings, and shall be single rubber-in-shear, double rubber-in-shear, or springs unless otherwise indicated. Each fan shall be selected to produce the capacity required at the fan total pressure indicated. Fan performance curve for each fan shall be submitted at the time the proposed testing program is submitted. Sound power data for each fan in all octave bands at mid-frequencies shall be submitted. The sound power level values shall be obtained in accordance with AMCA 300. Standard AMCA arrangement, rotation, and discharge shall be as indicated.

#### 2.9.2.2 In-Line Centrifugal Fans (EF-3)

In-line fans shall have centrifugal backward inclined blades, stationary discharge conversion vanes, internal and external belt guards, and adjustable motor mounts. Fans shall be mounted in a welded tubular casing. Air shall enter and leave the fan axially. Inlets shall be streamlined with conversion vanes to eliminate turbulence and provide smooth discharge air flow. Fan bearings and drive shafts shall be enclosed and isolated from the air stream. Fan bearings shall be sealed against dust and dirt and shall be permanently lubricated, and shall be precision self aligning ball or roller type. Bearing life shall be L50 rated at not less than 200,000 hours as defined by AFBMA Std 9 and AFBMA Std 11. Motors shall have totally enclosed enclosure.

#### 2.9.2.3 Power Roof Ventilators

Power roof ventilators shall be of the centrifugal type with a weathertight housing and turned down rectangular base constructed of aluminum. Fan discharge openings shall be provided with framed and removable 2-inch stainless steel wire mesh bird screens suitable for the weathertight housings. All fasteners shall be stainless steel. Sealed, permanently lubricated sleeve, roller, or ball bearings with provision for end thrust shall be provided. Motor enclosures shall be totally enclosed type. Combination motor starters and disconnects shall be provided with the fans. Motor-operated backdraft dampers shall be provided as indicated. Motors shall be provided with factory installed and wired safety disconnect switch mounted under the fan housing adjacent to the motor.

### 2.10 FACTORY PAINTING

Units which are not of galvanized construction according to ASTM A 123/A 123M or ASTM A 924/A 924M shall be factory painted with a corrosion resisting paint finish. Internal and external ferrous metal surfaces shall be cleaned, phosphatized and coated with a paint finish which has been tested according to ASTM B 117, ASTM D 1654, and ASTM D 3359. Evidence of satisfactory paint performance for a minimum of 125 hours for units to be installed indoors and 500 hours for units to be installed outdoors shall be submitted. Rating of failure at the scribe mark shall be not less than 6, average creepage not greater than 1/8 inch. Rating of the inscribed area shall not be less than 10, no failure. On units constructed of galvanized steel which have been welded, exterior surfaces of welds or welds that have burned through from the interior shall receive a final shop docket of zinc-rich protective paint according to ASTM D 520 Type I.

### 2.11 UNIT HEATERS

Heaters shall be sized as scheduled on the contract drawings, and shall have a heating capacity not in excess of 125 percent of the capacity indicated. Noise level of each unit heater for areas noted shall not exceed the criteria indicated.

#### 2.11.1 Propeller Fan Heaters

Heaters shall be designed for suspension and arranged for horizontal discharge of air as indicated. Casings shall be not less than 20 gauge black steel and finished with lacquer or enamel. Suitable stationary deflectors shall be provided to assure proper air and heat penetration capacity at floor level based on established design temperature. Suspension from heating pipes will not be permitted. Horizontal discharge type unit heaters shall have discharge or face velocities not in excess of the following:

| Unit Capacity, | cfm | Face Velocity, fpm |
|----------------|-----|--------------------|
| Up to 1,000    |     | 800                |
| 1,001 to 3,000 |     | 900                |
| 3,001 and over |     | 1,000              |

#### 2.11.2 Motors

Motors shall be provided with NEMA 250 general purpose enclosure. Motors and motor controls shall otherwise be as specified in Section 16415 ELECTRICAL WORK, INTERIOR.

#### 2.11.3 Motor Switches

Motors shall be provided with manual selection switches with "Off," and "Automatic" positions and shall be equipped with thermal overload protection.

### PART 3 EXECUTION

#### 3.1 GENERAL INSTALLATION CRITERIA

The HVAC control system shall be installed and ready for operation, as specified and shown. Dielectric isolation shall be provided where dissimilar metals are used for connection and support. Penetrations through and mounting holes in the building exterior shall be made watertight. The HVAC control system installation shall provide clearance for control system maintenance by maintaining access space required to calibrate, remove, repair, or replace control system devices. The control system installation shall not interfere with the clearance requirements for mechanical installation shall not interfere with the clearance requirements for mechanical and electrical system maintenance.

##### 3.1.1 Device Mounting Criteria

Devices mounted in or on piping or ductwork, on building surfaces, in mechanical/electrical spaces, or in occupied space ceilings shall be installed in accordance with manufacturer's recommendations and as shown. Control devices to be installed in piping and ductwork shall be provided with all required gaskets, flanges, thermal compounds, insulation, piping,

fittings, and manual valves for shutoff, equalization, purging, and calibration. Strap-on temperature sensing elements shall not be used except as specified.

#### 3.1.2 Wiring Criteria

Wiring external to control panels, including low-voltage wiring, shall be installed in metallic raceways. Wiring shall be installed without splices between control devices and HVAC control panels. Cables and conductors shall be tagged at both ends, with the identifier shown on the shop drawings, in accordance with the requirements of Section 16415 ELECTRICAL WORK, INTERIOR. Other electrical work shall be as specified in Section 16415 ELECTRICAL WORK, INTERIOR and as shown.

#### 3.1.3 Access Panels

Access panels shall be provided for concealed valves, vents, controls, dampers, and items requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced and maintained or completely removed and replaced. Access panels shall be as specified in Section 05500 MISCELLANEOUS METALS.

#### 3.1.4 Flexible Connectors

Pre-insulated flexible connectors and flexible duct shall be attached to other components in accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Hangers, when required to suspend the connectors, shall be of the type recommended by the connector or duct manufacturer and shall be provided at the intervals recommended.

#### 3.1.5 Sleeved and Framed Openings

Space between the sleeved or framed opening and the duct or the duct insulation shall be packed as specified in Section 07900 JOINT SEALING for nonfire rated penetrations.

#### 3.1.6 Metal Ductwork

Installation shall be according to SMACNA HVAC Duct Const Stds unless otherwise indicated. Duct supports for sheet metal ductwork shall be according to SMACNA HVAC Duct Const Stds, unless otherwise specified. Friction beam clamps indicated in SMACNA HVAC Duct Const Stds shall not be used. Risers on high velocity ducts shall be anchored in the center of the vertical run to allow ends of riser to move due to thermal expansion. Supports on the risers shall allow free vertical movement of the duct. Supports shall be attached only to structural framing members and concrete slabs. Supports shall not be anchored to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided. Where C-clamps are used, retainer clips shall be provided.

#### 3.1.7 Insulation

Thickness and application of insulation materials for ductwork, piping, and equipment shall be according to Section 15250 MECHANICAL INSULATION.

#### 3.1.8 Power Transmission Components Adjustment

V-belts and sheaves shall be tested for proper alignment and tension prior to operation and after 72 hours of operation at final speed. Belts on drive side shall be uniformly loaded, not bouncing. Alignment of direct driven couplings shall be to within 50 percent of manufacturer's maximum allowable range of misalignment.

### 3.2 DUCTWORK LEAK TEST

Ductwork leak test shall be performed for the entire air distribution and exhaust system, including fans, coils, filters, etc. Test procedure, apparatus, and report shall conform to SMACNA Leakage Test Mnl. Ductwork leak test shall be completed with satisfactory results prior to applying insulation to ductwork exterior.

### 3.3 CONTROL SYSTEM INSTALLATION

#### 3.3.1 Damper Actuators

Actuators shall not be mounted in the air stream. Multiple actuators operating a common damper shall be connected to a common drive shaft. Actuators shall be installed so that their action shall seal the damper to the extent required to maintain leakage at or below the specified rate and shall move the blades smoothly.

#### 3.3.2 Room-Instrument Mounting

Room instruments, such as wall mounted thermostats, shall be mounted 5 feet above the floor unless otherwise noted.

### 3.4 CONTROL SEQUENCES OF OPERATION

#### 3.4.1 System Requirements

These requirements shall apply to all primary HVAC systems unless modified herein. The sequences describe the actions of the control system for one direction of change in the HVAC process analog variable, such as temperature, humidity or pressure. The reverse sequence shall occur, with adequate dead band, when the direction of change is reversed.

#### 3.4.2 Electric Unit-Heaters (EUH-1 and EUH-2)

A wall-mounted thermostat with an "AUTO-OFF" switch, shall cycle the fan to maintain a setpoint of 45 degrees F (adjustable) when the switch is in the "AUTO" position. When the switch is in the "OFF" position, the fan shall be stopped.

#### 3.4.3 Exhaust Fan: EF-1 (Operating Floor)

EF-1 shall be interlocked with damper operator CD-2.

EF-1 shall be a 2-speed fan. At "High" speed, fan shall operate at 100 percent capacity. At "Low" speed, fan shall operate at approximately 50 percent capacity. EF-1 shall be controlled through an "Hand-Off-Auto" switch located near fan. In "Hand" position, EF-1 shall operate continuously at "Low" speed and Damper CD-2 shall be open. In "Off" position, EF-1 shall be de-energized and Damper CD-2 shall be closed. In "Auto" position, EF-1 shall be operated at "High" speed through a space mounted thermostat (see sequence below).

#### 3.4.4 Exhaust Fan: EF-2 (Sump Floor)

EF-2 shall be interlocked with the submersible pump control panel and the pump room lights.

EF-2 shall be controlled through an "Hand-Off-Auto" switch located near the fan. In the "Hand" position, EF-2 shall operate continuously. In the "Off" position, EF-2 shall be de-energized. In the "Auto" position, EF-2 shall energize when any of the pumps energize (submersible storm water pumps or the sump pump) or when the pump room lights are "On." In the "Auto" position, EF-2 shall be de-energized when none of the pumps are running and the pump room lights are "Off."

#### 3.4.5 Emergency Generator Damper Sequences

When the emergency generator is started, makeup air damper CD-2 and exhaust damper CD-1 shall open. Damper motors shall be connected to emergency power. The damper shall fail closed. Each motor-operated damper shall have a test button for testing the operation of the dampers. When the button is pushed, the damper shall open; when the button is released, the damper shall close. The test button shall be located in an watertight enclosure next to associated operator.

Engine Generator Off: EUH-1 and EUH-2 cycle to maintain thermostat set point of 45 degrees F (adjustable). Radiator exhaust control damper CD-1 and makeup air damper CD-2 are closed.

Engine Generator On: EUH-1 and EUH-2 cycle to maintain thermostat set point of 45 degrees F. When engine generator is energized, CD-2 (outside air make-up damper) shall open 100 percent, CD-1 (exhaust air damper) shall open to 10 percent (adjustable), and CD-3 (return air damper) shall open 100 percent. Upon a rise in space temperature to 60 degrees F (adjustable), CD-2 shall modulate between 10 percent to 100 percent open and CD-3 shall modulate between 100 percent and 10 percent open to maintain space temperature of 65 degrees F. When space temperature reaches 75 degrees F increasing (adjustable), exhaust fan EF-1 shall energize. When space temperature reaches 70 degrees F decreasing (adjustable), EF-1 shall de-energize.

The Contractor shall test the operation of the engine generator set radiator fan and dampers to set minimum closed position for exhaust damper CD-1. When CD-1 is at minimum closed position, CD-3 shall be 100 percent open and the fan shall operate at full capacity at less then 0.5 inch total external static pressure.

### 3.5 COMMISSIONING PROCEDURES

#### 3.5.1 General Procedures

##### 3.5.1.1 Evaluations

The Contractor shall make the observations, adjustments, calibrations, measurements, and tests of the control systems, tune the controllers, set the time clock schedule, and make any necessary control-system corrections to ensure that the systems function as described in paragraph CONTROL SEQUENCES OF OPERATION. The Contractor shall permanently record, on system equipment schedule, the final setting of controller proportional, integral and derivative constant settings, setpoint, manual reset setting, maximum and minimum controller output, and ratio and bias settings, in units and

terminology specific to the controller.

#### 3.5.1.2 Item Check

An item-by-item check of the sequence of operation requirement shall be performed using Steps 1 through 4 in the specified control system commissioning procedures. Steps 1, 2, and 3 shall be performed with the HVAC system shutdown; Step 4 shall be performed after the HVAC systems have been started. Signals used to change the mode of operation shall originate from the actual HVAC control device intended for the purpose, such as the time clock. External input signals to the HVAC control panel (such as EMCS, starter auxiliary contacts, and external systems) may be simulated in Steps 1, 2, and 3. With each operational-mode change signal, pilot lights and HVAC-panel output-relay contacts shall be observed to ensure that they function. All terminals assigned to EMCS shall be checked and observed to ensure that the proper signals are available.

#### 3.5.1.3 Configuration

The Contractor shall configure each controller for its specified service.

#### 3.5.2 Unit Heater

The "OFF/AUTO" switch shall be placed in the "OFF" position. Each space-thermostat temperature setting shall be turned up so that it makes contact to turn on the unit-heater fans. The unit-heater fans shall not start. The "OFF/AUTO" switch shall be placed in the "AUTO" position. The unit-heater fans shall start. Each space-thermostat temperature setting shall be turned down, and the unit-heater fans shall stop. The thermostats shall be set at their temperature setpoints shown. The results of testing of one of each type of unit shall be logged.

### 3.6 BALANCING, COMMISSIONING, AND TESTING

#### 3.6.1 Coordination with HVAC System Balancing

Commissioning of the control system, except for tuning of controllers, shall be performed prior to or simultaneous with HVAC system balancing. The Contractor shall tune the HVAC control system after all air-system and hydronic-system balancing has been completed, minimum damper positions set and a report has been issued.

#### 3.6.2 Control System Calibration, Adjustments, and Commissioning

Control system commissioning shall be performed for each HVAC system, using test plans and procedures previously approved by the Government. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform commissioning and testing of the HVAC control system. All instrumentation and controls shall be calibrated and the specified accuracy shall be verified using test equipment with calibration traceable to NIST standards. Wiring shall be tested for continuity and for ground, open, and short circuits. Tubing systems shall be tested for leaks. Mechanical control devices shall be adjusted to operate as specified. HVAC control panels shall be pretested off-site as a functioning assembly ready for field connections, calibration, adjustment, and commissioning of the operational HVAC control system. Written notification of any planned commissioning or testing of the HVAC Control systems shall be given to the Government at least 14 calendar days in advance.

### 3.6.3 Performance Verification Test

The Contractor shall demonstrate compliance of the HVAC control system with the contract documents. Using test plans and procedures previously approved by the Government, the Contractor shall demonstrate all physical and functional requirements of the project. The performance verification test shall show, step-by-step, the actions and results demonstrating that the control systems perform in accordance with the sequences of operation. The performance verification test shall not be started until after receipt by the Contractor of written permission by the Government, based on Government approval of the commissioning report and completion of balancing. The tests shall not be conducted during scheduled seasonal off-periods of base heating and cooling systems.

### 3.6.4 Posted and Panel Instructions

Posted and panel instructions, showing the final installed conditions, shall be provided for each system. The posted instructions shall consist of half-size laminated drawings and shall include the control system schematic, equipment schedule, ladder diagram, sequence of operation, panel arrangement drawings, wiring diagram, and valve and damper schedules. The posted instructions shall be permanently affixed, by mechanical means, to a wall near the control panel. Panel instructions shall consist of laminated letter-size sheets and shall include a routine maintenance checklist and controller configuration check sheets with final configuration record for each controller. Panel instructions and one copy of the operation and maintenance manuals, previously described herein, shall be placed inside each control panel.

## 3.7 TRAINING

### 3.7.1 Training-Course Requirements

A training course shall be conducted for all operating staff members designated by the Contracting Officer. The training period, during normal working time, shall be conducted within 30 days after successful completion of the performance verification test. The training course shall be conducted at the project site. Audiovisual equipment and sets of all other training materials and supplies shall be provided. A training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunchtime, Monday through Friday, during the daytime shift in effect at the training facility.

### 3.7.2 Training-Course Content

For guidance in planning the required instruction, the Contractor shall assume that attendees will have a high school education or equivalent, and are familiar with HVAC systems. The training course shall cover all of the material contained in the operating and maintenance instructions, the layout and location of each HVAC control panel, the layout of one of each type of unitary equipment and the locations of each, the location of each system-control device external to the panels, the location of the compressed-air station, preventive maintenance, troubleshooting, diagnostics, calibration, adjustment, commissioning, tuning, and repair procedures. Typical systems and similar systems may be treated as a group, with instruction on the physical layout of one such system. The results of the performance verification test and the calibration, adjustment and commissioning report shall be presented as benchmarks of HVAC



control-system performance by which to measure operation and maintenance effectiveness.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16120

INSULATED WIRE AND CABLE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, STORAGE, AND HANDLING
- 1.4 PROJECT/SITE CONDITIONS

PART 2 PRODUCTS

- 2.1 MATERIALS
  - 2.1.1 Wire Table
  - 2.1.2 Rated Circuit Voltages
  - 2.1.3 Conductors
    - 2.1.3.1 Material
    - 2.1.3.2 Size
    - 2.1.3.3 Stranding
    - 2.1.3.4 Separator Tape
  - 2.1.4 Insulation
    - 2.1.4.1 Insulation Material
    - 2.1.4.2 Insulation Thickness
  - 2.1.5 Jackets
    - 2.1.5.1 Jacket Material
    - 2.1.5.2 Jacket Thickness
  - 2.1.6 Identification
    - 2.1.6.1 Color-coding
  - 2.1.7 Dimensional Tolerance
- 2.2 TESTS, INSPECTIONS, AND VERIFICATIONS
  - 2.2.1 Cable Data
  - 2.2.2 Inspection and Tests
    - 2.2.2.1 Flame Tests
    - 2.2.2.2 Independent Tests
    - 2.2.2.3 Reports

PART 3 EXECUTION (Not Applicable)

-- End of Section Table of Contents --

SECTION 16120

INSULATED WIRE AND CABLE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

|              |   |
|--------------|---|
| IEEE Std 383 | (1974; R 1992) Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations |
|--------------|---|

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

|           |   |
|-----------|---|
| NEMA WC 7 | (1988; Rev 3 1996)<br>Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy |
| NEMA WC 8 | (1988; Rev 3 1996)<br>Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy               |

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Installation Instructions; FIO.

The Contractor shall submit cable manufacturing data as requested.

SD-09 Reports

Tests, Inspections, and Verifications; FIO.

Six certified copies of test reports shall be submitted by the Contractor.

1.3 DELIVERY, STORAGE, AND HANDLING

Reels shall remain the property of the Contractor.

1.4 PROJECT/SITE CONDITIONS

PART 2 PRODUCTS

## 2.1 MATERIALS

### 2.1.1 Wire Table

Wire and cable shall be furnished in accordance with the requirements of the drawings and shall conform to the detailed requirements specified herein.

### 2.1.2 Rated Circuit Voltages

All wire and cable shall have minimum rated circuit voltages in accordance with Table 3-1 of NEMA WC 7 or NEMA WC 8.

### 2.1.3 Conductors

#### 2.1.3.1 Material

Conductors shall conform to all the applicable requirements of Section 2 of NEMA WC 7 or Part 2 of NEMA WC 8 as applicable and shall be annealed copper. Copper conductors may be bare, or tin- or lead-alloy-coated, if required by the type of insulation used.

#### 2.1.3.2 Size

Minimum wire size shall be No. 12 AWG for power and lighting circuits; No. 10 AWG for current transformer secondary circuits; No. 14 AWG for potential transformer, relaying, and control circuits; and No. 19 AWG for alarm circuits.

#### 2.1.3.3 Stranding

Conductor stranding classes cited herein shall be as defined in Appendix L of NEMA WC 7 or NEMA WC 8, as applicable. Lighting conductors No. 10 AWG and smaller shall be solid or have Class B stranding. Any conductors used between stationary and moving devices, such as hinged doors or panels, shall have Class H or K stranding. All other conductors shall have Class B or C stranding, except that conductors shown on the drawings, or in the schedule, as No. 12 AWG may be 19 strands of No. 25 AWG, and conductors shown as No. 10 AWG may be 19 strands of No. 22 AWG.

#### 2.1.3.4 Separator Tape

Where conductor shielding, strand filling, or other special conductor treatment is not required, a separator tape between conductor and insulation is permitted.

### 2.1.4 Insulation

#### 2.1.4.1 Insulation Material

Insulation shall be cross-linked thermosetting polyethylene (XLPE) type, meeting the requirements of Section 3 or paragraph 7.7 of NEMA WC 7 as applicable, or an ethylene-propylene rubber (EPR) type meeting the requirements of Part 3 of NEMA WC 8.

#### 2.1.4.2 Insulation Thickness

The insulation thickness for each conductor shall be based on its rated

circuit voltage.

#### 2.1.5 Jackets

All cables shall have jackets meeting the requirements of Section 4 of NEMA WC 7, or Part 4 of NEMA WC 8, as applicable, and as specified herein. Individual conductors of multiple-conductor cables shall be required to have jackets only if they are necessary for the conductor to meet other specifications herein. Jackets of single-conductor cables and of individual conductors of multiple-conductor cables, shall be in direct contact and adhere or be vulcanized to the conductor insulation. Multiple-conductor cables and shielded single-conductor cables shall be provided with a common overall jacket, which shall be tightly and concentrically formed around the core. Repaired jacket defects found and corrected during manufacturing are permitted if the cable, including jacket, afterward fully meets these specifications and the requirements of the applicable standards.

##### 2.1.5.1 Jacket Material

The jacket shall be one of the materials listed below.

###### a. General Use

- (1) Heavy-duty black neoprene (NEMA WC 8, paragraph 4.4.3).
- (2) Heavy-duty chlorosulfonated polyethylene (NEMA WC 8, paragraph 4.4.10).
- (3) Heavy-duty cross-linked (thermoset) chlorinated polyethylene (NEMA WC 8, paragraph 4.4.11).

##### 2.1.5.2 Jacket Thickness

The minimum thickness of the jackets at any point shall be not less than 80 percent of the respective nominal thicknesses specified below.

a. Multiple-Conductor Cables - Thickness of the jackets of the individual conductors of multiple-conductor cables shall be as required by Section 4, Table 4-6 of NEMA WC 7 or Part 4, Table 4-4 of NEMA WC 8, and shall be in addition to the conductor insulation thickness required by Column B of Table 3-1 of the applicable NEMA publication for the insulation used. Thickness of the outer jackets or sheaths of the assembled multiple-conductor cables shall be as required by Section 4, Table 4-7, of NEMA WC 7 or Part 4, Table 4-5, of NEMA WC 8.

b. Single-Conductor Cables - Single-conductor cables, if nonshielded, shall have a jacket thickness as specified in Section 4, Table 4-4 of NEMA WC 7 or Part 4, Table 4-2 of NEMA WC 8.

#### 2.1.6 Identification

##### 2.1.6.1 Color-coding

Refer to Section 16415 ELECTRICAL WORK, INTERIOR for conductor identification and tagging.

##### 2.1.7 Dimensional Tolerance

The outside diameters of single-conductor cables and of multiple-conductor cables shall not vary more than 5 percent and 10 percent, respectively, from the manufacturer's published catalog data.

## 2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

### 2.2.1 Cable Data

Cable data shall be submitted for approval including dimensioned sketches showing cable construction, and sufficient additional data to show that these specifications will be satisfied.

### 2.2.2 Inspection and Tests

Inspection and tests of wire and cable furnished under these specifications shall be made by and at the plant of the manufacturer. The Government may perform further tests before or after installation. Testing in general shall comply with Section 6 of NEMA WC 7 or Part 6 of NEMA WC 8. Specific tests required for particular materials, components, and completed cables shall be as specified in the sections of the above standards applicable to those materials, components, and cable types. Tests shall also be performed in accordance with the additional requirements specified below.

#### 2.2.2.1 Flame Tests

All multiple-conductor and single-conductor cable assemblies shall pass IEEE Std 383 flame tests, paragraph 2.5, using the ribbon gas burner. Single-conductor cables and individual conductors of multiple-conductor cables shall pass the flame test of NEMA WC 7, paragraph 7.7.3.1.3. If such tests, however, have previously been made on identical cables, these tests need not be repeated. Instead, certified reports of the original qualifying tests shall be submitted. In this case the reports furnished under paragraph REPORTS, shall verify that all of each cable's materials, construction, and dimensions are the same as those in the qualifying tests.

#### 2.2.2.2 Independent Tests

The Government may at any time make visual inspections, continuity or resistance checks, insulation resistance readings, power factor tests, or dc high-potential tests at field test values. A cable's failure to pass these tests and inspections, or failure to produce readings consistent with acceptable values for the application, will be grounds for rejection of the cable.

#### 2.2.2.3 Reports

Results of tests made shall be furnished. No wire or cable shall be shipped until authorized. Lot number and reel or coil number of wire and cable tested shall be indicated on the test reports.

## PART 3 EXECUTION (Not Applicable)

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16239

ENGINE RADIATOR AIRFLOW-COOLED LOAD BANK

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SYSTEM DESCRIPTION
- 1.3 WARRANTY
- 1.4 MANUFACTURER'S QUALIFICATIONS

PART 2 PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURER
- 2.2 ELECTRICAL CONNECTION
- 2.3 LOAD BANK RATING
- 2.4 LOAD BANK DESIGN
  - 2.4.1 Enclosure
  - 2.4.2 Load Elements
  - 2.4.3 Load Element Short Circuit Protection
  - 2.4.4 Load Control
  - 2.4.5 Power Wiring
  - 2.4.6 Main Terminals
  - 2.4.7 Control Wiring
  - 2.4.8 Control Power
  - 2.4.9 System Protection
- 2.5 LOCAL CONTROL PANEL
- 2.6 AUTOMATIC LOAD BANK CONTROLLER

PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 MANUFACTURER'S FIELD SERVICES

-- End of Section Table of Contents --

SECTION 16239

ENGINE RADIATOR AIRFLOW-COOLED LOAD BANK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

UNDERWRITERS LABORATORIES (UL)

UL 1030 (1994) Sheathed Heating Elements Sixth Edition

1.2 SYSTEM DESCRIPTION

Provide engine radiator airflow-cooled, resistive load bank for permanent, on-site installation as a component for each Government-furnished standby engine generator system. The load bank shall be designed for local control, with automatic and manual operation capability. The load bank shall bear the listing mark of Underwriters Laboratories (UL Listing).

1.3 WARRANTY

The load bank shall be supplied with a 2-year manufacturer's warranty, which covers all materials and service labor. The manufacturer shall demonstrate the availability of factory service technicians in support of the load bank.

1.4 MANUFACTURER'S QUALIFICATIONS

The load bank shall be a product of a firm regularly engaged in the design and manufacture of generator load banks. The load bank manufacturer shall demonstrate at least five years experience, with at least twenty-five successful installations of load banks, similar or equal to the load banks specified herein.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

Simplex LBD Series, or other approved equal.

2.2 ELECTRICAL CONNECTION

Power source to load bank connection shall be 3-phase, 4-wire plus ground. Additional control wire connections for remote control as required.

2.3 LOAD BANK RATING

Provide 3 separate load banks with the following capacities:



a. One at capacity: 125 kW, 1.0 p.f.

b. Two at capacity: 250 kW, 1.0 p.f.

Load banks shall be rated for 50 percent of total generator rating. Load steps shall be in manufacturer's suggested increments, in order to obtain specific rating. Voltage shall be 480 volts ac, three-phase, 4-wire. Frequency shall be 60 Hertz. Air intake temperature shall be 155 degrees F max (radiator air outflow). Provide radiator air outflow. Load bank shall have continuous duty cycle, air temperature rise of 100 degrees F, nominal, and an air back pressure of 0.25-0.50 inch water column.

## 2.4 LOAD BANK DESIGN

The load bank shall be a completely self-contained unit which includes all resistive load elements, load control devices, load element branch circuit fuse protection, main load bus and terminals, control terminals, system protection devices and NEMA enclosure of required type. The load bank shall be the manufacturer's standard product that has been investigated, tested and listed by Underwriters Laboratories, as a system for the purpose intended. Simple assemblies of listed parts that are not system UL listed shall not be acceptable.

### 2.4.1 Enclosure

NEMA Type 1, galvanized steel, unit construction, consisting of a power section, for installation and wiring of the load elements and a control section for installation and wiring of control components. The control section is to be physically and thermally isolated from both the hot load elements and the heated airflow. Load Bank shall be provided with adjustable height, floor mounting adaptors, for independent support of unit. Ductwork shall be supported separately. Load bank shall also be provided with a flexible isolating transition from the generator radiator, along with sheet metal duct on both sides of the load bank as shown on drawings.

### 2.4.2 Load Elements

Load elements shall be in accordance with UL 1030, labeled or recognized, totally enclosed, sealed and weather-proof with an electrically grounded outer sheath such that the element can not be electrically short-circuited by external foreign objects and personnel are protected against accidental electrical shock. Elements shall be individually replaceable. Open wire type elements in which the electrically live conductors are exposed and which can be short circuited to each other or to ground by foreign objects or by the breakage of an element or an element support shall not be permitted.

### 2.4.3 Load Element Short Circuit Protection

Branch circuit fuses, per each 50 kW load branch circuit. Fuses shall be 200,000 A.I.C current limiting type.

### 2.4.4 Load Control

One magnetic contactor per each fused branch circuit.

### 2.4.5 Power Wiring

Load bank power wiring shall be 302 degrees F insulated.

#### 2.4.6 Main Terminals

Barrier type power terminal block with compression type terminal to accept stranded building wire. Provide chassis ground stud with compression type terminal.

#### 2.4.7 Control Wiring

Control wiring shall be 221 degrees F insulated.

#### 2.4.8 Control Power

Control power shall be derived internally from the main load bus. Control and protective circuits shall operate at 120 volts via control power transformer or line-neutral circuit and shall be fused.

#### 2.4.9 System Protection

The load bank shall include a comprehensive protection system to protect against overheating. The system shall function to disconnect the load elements from the power source and activate an alarm upon sensing an exhaust air temperature greater than 300 degrees F.

### 2.5 LOCAL CONTROL PANEL

Control panel shall be NEMA 1 for automatic and manual operation. The panel shall include:

- a. Control power on-off pushbuttons.
- b. Automatic and Manual operation switch.
- c. "Normal operation" indicator lamp.
- d. Master load control switch.
- e. Load step control switches.
- f. "Cooling failure" alarm indicator lamp.

### 2.6 AUTOMATIC LOAD BANK CONTROLLER

The load bank is to be equipped with an automatic controller, which will be activated when the load bank mode control selector switch is placed in the "automatic" position. In automatic mode, the load bank is to be on-line and continuously operative whenever the power source runs. The load bank shall provide a component of the total power source load and shall be automatically variable in response to dynamic total load demands upon the power source. The automatic controller shall include control logic, solid-state sensors and time delays, which shall act to apply or remove load bank component in multiple steps in response to dynamic output of the power source. The automatic controller shall function to maintain 50 percent total load upon the power source within a preset bandwidth by adding load bank load component as external load component drops and removing load bank component as external load rises. The automatic controller shall sense load kilowatts. Full manual control of the load bank shall be restored when the mode selector switch is placed in the

"manual" position. The automatic controller shall include a solid-state load sensor with level and time delay adjustment and output contacts for each load step. A current transformer for external installation shall be provided.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

The load bank shall be installed within the air outflow of the engine unit mounted radiator and shall be cooled by the radiator airflow. Install load bank within radiator exhaust air duct. Provide flexible transition from radiator to duct and solid duct transition to load bank and outlet control dampers.

#### 3.2 MANUFACTURER'S FIELD SERVICES

Provide manufacturer's field representative for one day start-up service, for each installation of the load bank, on site, after the load bank has been installed and connected.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16264

DIESEL-GENERATOR SET

PART 1 GENERAL

- 1.1 SCOPE
- 1.2 REFERENCES
- 1.3 SUBMITTALS
- 1.4 SYSTEM DESCRIPTION
- 1.5 GENERAL REQUIREMENTS
  - 1.5.1 Verification of Dimensions
  - 1.5.2 Conformance to Codes and Standards
  - 1.5.3 Site Welding
  - 1.5.4 Field Engineer
- 1.6 STORAGE AND INSTALLATION

PART 2 PRODUCTS

- 2.1 MATERIALS AND EQUIPMENT
  - 2.1.1 Workmanship
  - 2.1.2 Materials and Equipment
  - 2.1.3 Ductwork
  - 2.1.4 Flexible Connector
- 2.2 COOLING
  - 2.2.1 Ductwork
  - 2.2.2 200 kW Engine Generator Set At Pump Station D3
    - 2.2.2.1 Air-To-Water Radiator System
    - 2.2.2.2 Air-To-Air Charge Air Cooling System
    - 2.2.2.3 Verification Testing
- 2.3 EXHAUST SYSTEM
  - 2.3.1 Exhaust Piping
- 2.4 MANUAL ENGINE-GENERATOR SET SYSTEM OPERATION
- 2.5 THERMAL INSULATION
- 2.6 FUEL TANK VENTS AND VENT PIPING

PART 3 EXECUTION

- 3.1 GENERAL INSTALLATION
- 3.2 PIPING INSTALLATION
  - 3.2.1 General
  - 3.2.2 Supports
    - 3.2.2.1 Ceiling and Roof
    - 3.2.2.2 Wall
  - 3.2.3 Flanged Joints
  - 3.2.4 Cleaning
  - 3.2.5 Pipe Sleeves
- 3.3 ELECTRICAL INSTALLATION
  - 3.3.1 Vibration Isolation
- 3.4 FIELD PAINTING

- 3.5 ONSITE INSPECTION AND TESTS
  - 3.5.1 Test Conditions
    - 3.5.1.1 Sequence
  - 3.5.2 Construction Tests
    - 3.5.2.1 Piping Test
    - 3.5.2.2 Electrical Equipment Tests
- 3.6 ACCEPTANCE

-- End of Section Table of Contents --

SECTION 16264

DIESEL-GENERATOR SET

PART 1 GENERAL

1.1 SCOPE

This section covers the furnishing and installing of the necessary ductwork, exhaust system, electrical connections, and any other power distribution equipment as shown and specified herein to complete the installation of Government-furnished generators for all three pump stations as indicated on the drawings. The handling, installing, connecting of these Government-furnished generators, connection to the electrical distribution system, the standby generator cooling removal system, engine exhaust and other associated equipment including connection to the automatic transfer switch, are also part of the Contractor's work under this section.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASME INTERNATIONAL (ASME)

ASME B31.1 (1998) Power Piping

ASME BPV IX (1998) Boiler and Pressure Vessel Code;  
Section IX, Welding and Brazing  
Qualifications

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53 (1999b) Pipe, Steel, Black and Hot-Dipped,  
Zinc-Coated, Welded and Seamless

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code

IEEE Std 81 (1983) Guide for Measuring Earth  
Resistivity, Ground Impedance, and Earth  
Surface Potentials of a Ground System  
(Part 1)

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS  
INDUSTRY (MSS)

MSS SP-58 (1993) Pipe Hangers and Supports -  
Materials, Design and Manufacture

MSS SP-69 (1996) Pipe Hangers and Supports -  
Selection and Application

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30 (1996; Errata TIA 96-2) Flammable and Combustible Liquids Code

NFPA 70 (1999) National Electrical Code

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J1508 (1997) Hose Clamp Specifications

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Materials and Equipment; FIO.

A complete list of accessory equipment and materials proposed (such as anchor bolts, exhaust components, etc), containing an adequate description of each separate item of equipment or materials recommended for approval, shall be furnished. The quantity of each item described shall be indicated.

Site Welding; FIO.

A letter listing the welder qualifying procedures for each welder, complete with supporting data such as test procedures used, what was tested to, and a list of the names of all welders and their qualifications symbols.

General Installation; FIO.

A complete copy of the manufacturer's installation procedures. A detailed description of the manufacturer's recommended break-in procedure.

SD-04 Drawings

Cooling; FIO.

Drawings shall be prepared that indicate sizes and physical configuration of the louvers, dampers, and ductwork required to connect the GFE generator and load bank into each pump station as shown on the drawings.

1.4 SYSTEM DESCRIPTION

Each engine-generator set shall be installed complete and totally functional, with all necessary ancillary equipment to include air filtration; starting system; generator controls, protection, and isolation; instrumentation; lubrication; fuel system; cooling system; and engine exhaust system. Each engine generator set shall satisfy the requirements specified in the Engine Generator Parameter Schedule.

## 1.5 GENERAL REQUIREMENTS

### 1.5.1 Verification of Dimensions

Before performing work, the premises shall be visited and details of the work verified. The Contracting Officer shall be advised in writing of any discrepancies before performing any work.

### 1.5.2 Conformance to Codes and Standards

Where equipment is specified to conform to requirements of any code or standard such as UL, the design, fabrication and installation shall conform to the code.

### 1.5.3 Site Welding

Structural members shall be welded in accordance with Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS. For all other welding, procedures and welders shall be qualified in accordance with ASME BPV IX. Welding procedures qualified by others, and welders and welding operators qualified by a previously qualified employer may be accepted as permitted by ASME B31.1. Welder qualification tests shall be performed for each welder whose qualifications are not in compliance with the referenced standards. The Contracting Officer shall be notified 24 hours in advance of qualification tests. The qualification tests shall be performed at the work site if practical. The welder or welding operator shall apply the assigned personal symbol near each weld made as a permanent record

### 1.5.4 Field Engineer

The engine-generator set manufacturer or assembler shall furnish a qualified field engineer to supervise the complete installation of the engine-generator set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment. The field engineer shall have attended the engine-generator manufacturer's training courses on installation and operation and maintenance for engine generator sets.

## 1.6 STORAGE AND INSTALLATION

The Contractor shall properly protect material and equipment in accordance with the manufacturers recommended storage procedures, before, during, and after installation. Stored items shall be protected from the weather and contamination. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

#### 2.1.1 Workmanship

Materials and equipment shall be installed in accordance with recommendations of the manufacturer and as shown.

#### 2.1.2 Materials and Equipment



Materials and Equipment shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section.

#### 2.1.3 Ductwork

All ductwork shall be made from galvanized steel sheets. All ductwork shall comply with SMACNA HVAC Duct Construction Standards. All ductwork shall be substantially airtight with no audible leaks, reinforced or crimped to prevent "panning" at system start-up and good rigid connections to louvers and dampers.

#### 2.1.4 Flexible Connector

The engine-generator shall be connected to the ductwork utilizing a flexible duct connector made of either fiberglass or neoprene strips bound to galvanized metal strips on each side. Duct connector shall be submitted for approval by the Contracting Officer's Representative.

### 2.2 COOLING

#### 2.2.1 Ductwork

Ductwork shall be as specified in Section 15500 HEATING, VENTILATION, AND AIR-CONDITIONING SYSTEMS except that a flexible connection shall be used to connect the duct to the diesel engine radiator. Material for the connection shall be wire-reinforced glass. The connection shall be rendered practically airtight.

#### 2.2.2 200 kW Engine Generator Set At Pump Station D3

The radiator for this set shall be removed from the engine and remotely mounted as shown on the drawings. The intent is to re-use the radiator and provide new piping, clamps, pipe supports and equipment required for remote cooling of the turbocharger air-to-air cooling system and the engine coolant.

Special care must be taken to ensure that the installation does not affect the performance of the engine generator set. The system must cool the intake manifold air and the engine coolant within the limits specified on the engine generator data sheets at the pressure limits listed.

Cooling Fan EF-3 shall be mounted in a blow through arrangement to cool the radiator. The blower fan sweep diameter shall be equal to or slightly smaller than the radiator dimensions, otherwise provide a fan shroud for a smooth transition between the fan and radiator. Allow at least 4 inches between the fan and the radiator.

##### 2.2.2.1 Air-To-Water Radiator System

Provide additional capacity by extending fill neck with vent for 6% by volume thermal expansion as required during testing. The capacity of the top tank shall be at least 17% of the total volume of coolant in the system to provide a coolant draw down capacity of 11%. Piping shall be provided as shown on the drawings. Install to minimize pipe bends and friction loss. Provide a drain valve in the system low point. Provide ball valves for system isolation from engine. Install test gauges required for verification testing.

#### 2.2.2.2 Air-To-Air Charge Air Cooling System

Piping shall be aluminized steel or internally and externally coated steel piping. All welds to be protected with high temperature rust preventative paint. All airflow direction changes shall be made with piping. Welds shall be kept to a minimum. The piping circuit shall contain a minimum number of bends and no short radius elbows may be used. Use a full 360 degree hose bead on pipe ends to prevent hose blow off. Bead radius shall be a minimum of 0.1 in. Hoses shall be able to withstand the temperatures and pressures in the system. Hoses shall be nomex reinforced, bellows type, silicone hoses with external reinforcing rings. Fiberglass reinforced hoses can not be used. Clamps shall be T-bolt style with a torque retention feature and a bridge section (SITB type clamp per SAE J1508 ). Install test gauges required for verification testing.

#### 2.2.2.3 Verification Testing

Employ the services of a manufacturer's representative for verification testing. The radiator and air-to-air charge air cooling system shall be tested to ensure compliance with the data sheets. Install permanent pressure taps with dial pressure gauges, thermocouples and dial thermometers all other equipment necessary for testing in locations recommended by manufacturer. In the event that the testing shows the values are not within the allowable limits, further testing shall be performed to pinpoint the cause and measures shall be taken to resolve the system design to achieve compliance with manufacturer's values. The following conditions must be met for the air-to-air cooling system:

- a. The difference in temperature of the intake air entering the intake manifold to that of the ambient air is less than or equal to the maximum value on the data sheet.
- b. The pressure drop across the entire air-to-air charge air cooling system is less than or equal to the maximum value on the data sheet.

The following conditions must be met for the radiator cooling system:

- a. The pressure difference between coolant supply and return measured near the connections to the engine shall be less than or equal to the maximum value on the data sheet.

### 2.3 EXHAUST SYSTEM

#### 2.3.1 Exhaust Piping

Horizontal sections of exhaust piping shall be sloped downward away from the engine to a condensate trap and drain valve. Changes in direction shall be long-radius. Exhaust piping, mufflers and silencers installed inside any building shall be insulated in accordance with Section 15250 MECHANICAL INSULATION and covered to protect personnel. Vertical exhaust piping shall be provided with a hinged, gravity operated, self-closing, rain cover. Exhaust pipe shall be Schedule 10 Type 304 stainless steel.

### 2.4 MANUAL ENGINE-GENERATOR SET SYSTEM OPERATION

Complete facilities shall be provided for manual starting and testing of each set without load, loading and unloading of each set.

### 2.5 THERMAL INSULATION

Thermal insulation shall be as specified in Section 15250 MECHANICAL INSULATION.

## 2.6 FUEL TANK VENTS AND VENT PIPING

Each Government furnished sub-base fuel tank is supplied with 1 normal vent cap and 2 emergency pressure relief vent caps. Contractor shall remove vent caps, reusing the two emergency vent caps and returning the normal vent cap to the Owner. Each vent connection shall be piped to the outdoors with piping of same diameter as connection and provided with a vertical vent cap. Vent piping shall not be manifolded. Emergency vent caps shall be reinstalled outdoors at the end of their respective vent pipe in the vertical. A normal vent cap shall be provided and installed in the vertical on the normal vent pipe. The normal vent cap shall be an updraft "open" vent to allow tank to "breathe" during filling/dispensing operations. Normal vent cap shall be 2 inch slip-on with set screws, aluminum body, aluminum cap and 40 mesh brass screen; Morrison Bros. Co. Fig. 354 or approved equal. Vent piping shall be Schedule 40 ASTM A 53 galvanized steel with threaded connections. Vent piping shall be isolated from tank and gen-set vibrations with flexible braided stainless steel connections. Vent piping penetrating exterior walls shall be provided with pipe sleeves and sealed/caulked watertight.

## PART 3 EXECUTION

### 3.1 GENERAL INSTALLATION

Installation shall provide clear space for operation and maintenance in accordance with NFPA 70 and IEEE C2. Installation of pipe, duct, conduit, and ancillary equipment shall be configured to facilitate easy removal and replacement of major components and parts of the engine-generator set.

### 3.2 PIPING INSTALLATION

#### 3.2.1 General

Piping shall be welded. Connections at valves shall be flanged. Connections at equipment shall be flanged except that connections to the diesel engine may be threaded if the diesel-engine manufacturer's standard connection is threaded. Except as otherwise specified, flanged fittings shall be utilized to allow for complete dismantling and removal of each piping system from the facility without disconnecting or removing any portion of any other system's equipment or piping. Connections to all equipment shall be made with flexible connectors. Pipes extending through the roof shall be properly flashed. Piping shall be installed clear of windows, doors, and openings to permit thermal expansion and contraction without damage to joints or hangers, and with a 1/2 inch drain valve at each low point.

#### 3.2.2 Supports

Hangers, inserts, and supports shall be of sufficient size to accommodate any insulation and shall conform to MSS SP-58 and MSS SP-69. Supports shall be spaced not more than 7 feet on center for pipes 2 inches in diameter or less, not more than 12 feet on center for pipes larger than 2 inches but no larger than 4 inches, and not more than 17 feet on center for pipes larger than 4 inches in diameter. Supports shall be provided at pipe bends or change of direction. On exhaust pipe, provide Type 39 protection

saddle to protect insulation and allow expansion; also, provide Type 1 steel clevis hanger.

#### 3.2.2.1 Ceiling and Roof

Vertical exhaust piping shall be supported with appropriately sized Type 42 or 3 clamps; all other piping shall be supported with appropriately sized Type 1 clevis and threaded rods. Insulate around clamps as required.

#### 3.2.2.2 Wall

Wall supports for pipe shall be made by suspending the pipe from appropriately sized Type 33 brackets with the appropriate ceiling and roof pipe supports.

#### 3.2.3 Flanged Joints

Flanges shall be 125 pound type, drilled, and of the proper size and configuration to match equipment and diesel-engine connections. Gaskets shall be factory cut in one piece 1/16 inch thick. Gaskets shall be Class Z, stainless steel with graphite filling spiral wound with outside compression gage ring.

#### 3.2.4 Cleaning

After fabrication and before assembly, piping interiors shall be manually wiped clean of all debris.

#### 3.2.5 Pipe Sleeves

Pipes passing through construction such as ceilings, floors, or walls shall be fitted with sleeves. Each sleeve shall extend through and be securely fastened in its respective structure and shall be cut flush with each surface. The structure shall be built tightly to the sleeve. The inside diameter of each sleeve shall be 1/2 inch, and where pipes pass through combustible materials, 1 inch larger than the outside diameter of the passing pipe or pipe covering.

### 3.3 ELECTRICAL INSTALLATION

Electrical installation shall comply with NFPA 70, IEEE C2, and Section 16415 ELECTRICAL WORK, INTERIOR.

#### 3.3.1 Vibration Isolation

Flexible fittings shall be provided for all conduit and raceways attached to engine-generator sets. Metallic conductor cables installed on the engine generator set and from the engine generator set to equipment not mounted on the engine generator set shall be flexible stranded conductor. Terminations of conductors on the engine generator set shall be crimp-type terminals or lugs.

### 3.4 FIELD PAINTING

Field painting shall be as specified in Section 09900 PAINTING, GENERAL.

### 3.5 ONSITE INSPECTION AND TESTS

#### 3.5.1 Test Conditions

#### 3.5.1.1 Sequence

The sequence of testing shall be as specified in the approved testing plan unless variance is authorized by the Contracting Officer. Field testing shall be performed in the presence of the Contracting Officer. Tests may be scheduled and sequenced in order to optimize run-time periods; however the following general order of testing shall be followed: Construction Tests; Inspections; Safety run Tests; and Performance Tests and Final Inspection.

#### 3.5.2 Construction Tests

Individual component and equipment functional tests for fuel piping, coolant piping, and lubricating-oil piping, electrical circuit continuity, insulation resistance, circuit protective devices, and equipment not provided by the engine-generator set manufacturer shall be performed prior to connection to the engine-generator set.

##### 3.5.2.1 Piping Test

- a. Lube-oil and fuel-oil piping shall be flushed with the same type of fluid intended to flow through the piping, until the outflowing fluid has no obvious sediment or emulsion.
- b. Fuel piping which is external to the engine-generator set shall be tested in accordance with NFPA 30. All remaining piping which is external to the engine generator set shall be pressure tested with air pressure at 150% of the maximum anticipated working pressure, but in no case less than 150 psig, for a period of 2 hours to prove the piping has no leaks. If piping is to be insulated, the test shall be performed before the insulation is applied.

##### 3.5.2.2 Electrical Equipment Tests

- a. Low-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the automatic transfer switch panelboard main disconnect switch distribution bus. Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations of conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 304,800 / (\text{length of cable in meters}).$

$(R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet}))$

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

- b. Ground-Resistance Tests. The resistance of each grounding electrode each grounding electrode system the ground mat the

ground ring shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- 1) Single rod electrode - 25 ohms.
- 2) Multiple rod electrodes - 10 ohms.
- 3) Ground mat - 5 ohms.

### 3.6 ACCEPTANCE

Final acceptance of the engine-generator set will not be given until the Contractor has successfully completed all tests and after all defects in installation material or operation have been corrected.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16415

ELECTRICAL WORK, INTERIOR

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL
  - 1.2.1 Rules
  - 1.2.2 Coordination
  - 1.2.3 Special Environments
    - 1.2.3.1 Weatherproof Locations
    - 1.2.3.2 Ducts, Plenums and Other Air-Handling Spaces
  - 1.2.4 Standard Products
  - 1.2.5 Nameplates
    - 1.2.5.1 Identification Nameplates
  - 1.2.6 As-Built Drawings
- 1.3 SUBMITTALS
- 1.4 WORKMANSHIP

PART 2 PRODUCTS

- 2.1 CABLES AND WIRES
  - 2.1.1 Equipment Manufacturer Requirements
  - 2.1.2 Aluminum Conductors
  - 2.1.3 Insulation
  - 2.1.4 Bonding Conductors
  - 2.1.5 Cord Sets and Power-Supply Cords
- 2.2 TRANSIENT VOLTAGE SURGE PROTECTION
- 2.3 CIRCUIT BREAKERS
  - 2.3.1 MOLDED-CASE CIRCUIT BREAKERS
    - 2.3.1.1 Construction
    - 2.3.1.2 Ratings
    - 2.3.1.3 Thermal-Magnetic Trip Elements
  - 2.3.2 Solid-State Trip Elements
  - 2.3.3 SWD Circuit Breakers
  - 2.3.4 HACR Circuit Breakers
  - 2.3.5 Ground Fault Circuit Interrupters
- 2.4 MOTOR SHORT-CIRCUIT PROTECTOR (MSCP)
  - 2.4.1 Construction
  - 2.4.2 Ratings
- 2.5 CONDUIT AND TUBING
  - 2.5.1 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)
  - 2.5.2 Electrical Plastic Tubing and Conduit
  - 2.5.3 Flexible Conduit, Steel and Plastic
  - 2.5.4 Intermediate Metal Conduit
  - 2.5.5 Rigid Metal Conduit
- 2.6 CONDUIT AND DEVICE BOXES AND FITTINGS
  - 2.6.1 Boxes, Metallic Outlet
  - 2.6.2 Boxes, Switch (Enclosed), Surface-Mounted

- 2.6.3 Fittings for Conduit and Outlet Boxes
- 2.6.4 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing
- 2.7 CONNECTORS, WIRE PRESSURE
  - 2.7.1 For Use With Copper Conductors
- 2.8 ELECTRICAL GROUNDING AND BONDING EQUIPMENT
  - 2.8.1 Ground Rods
  - 2.8.2 Ground Bus
- 2.9 ENCLOSURES
  - 2.9.1 Cabinets and Boxes
  - 2.9.2 Circuit Breaker Enclosures
- 2.10 LIGHTING FIXTURES, LAMPS, BALLASTS, EMERGENCY EQUIPMENT, CONTROLS AND ACCESSORIES
  - 2.10.1 Lamps
  - 2.10.2 Ballasts and Transformers
  - 2.10.3 Fixtures
  - 2.10.4 Lampholders, Starters, and Starter Holders
- 2.11 LOW-VOLTAGE FUSES AND FUSEHOLDERS
  - 2.11.1 Fuses, Low Voltage Cartridge Type
  - 2.11.2 Fuses, High-Interrupting-Capacity, Current-Limiting Type
  - 2.11.3 Fuses, Class K, High-Interrupting-Capacity Type
  - 2.11.4 Fuses, Class H
  - 2.11.5 Fuses, Class R
  - 2.11.6 Fuses, Class T
  - 2.11.7 Fuses for Supplementary Overcurrent Protection
  - 2.11.8 Fuseholders
- 2.12 INSTRUMENTS, ELECTRICAL INDICATING
- 2.13 MOTORS, AC, FRACTIONAL AND INTEGRAL
  - 2.13.1 Rating
  - 2.13.2 Motor Efficiencies
- 2.14 MOTOR CONTROLS AND MOTOR CONTROL CENTERS
  - 2.14.1 General
  - 2.14.2 Motor Starters
  - 2.14.3 Thermal-Overload Protection
  - 2.14.4 Low-Voltage Motor Overload Relays
    - 2.14.4.1 General
    - 2.14.4.2 Construction
    - 2.14.4.3 Ratings
  - 2.14.5 Automatic Control Devices
    - 2.14.5.1 Direct Control
    - 2.14.5.2 Pilot-Relay Control
    - 2.14.5.3 Manual/Automatic Selection
- 2.15 PANELBOARDS
- 2.16 RECEPTACLES
  - 2.16.1 Heavy Duty Grade
  - 2.16.2 Ground Fault Interrupters
  - 2.16.3 NEMA Standard Receptacle Configurations
- 2.17 Service Entrance Equipment
- 2.18 SPLICE, CONDUCTOR
- 2.19 SNAP SWITCHES
- 2.20 TAPES
  - 2.20.1 Plastic Tape
  - 2.20.2 Rubber Tape
- 2.21 TRANSFORMERS
  - 2.21.1 Transformers, Dry-Type
  - 2.21.2 Average Sound Level
- 2.22 ISOLATED POWER SYSTEM EQUIPMENT
- 2.23 WATTHOUR METERS, UTILITY REVENUE
- 2.24 INSTRUMENT TRANSFORMERS
  - 2.24.1 General



2.24.2 Current Transformers

2.24.2.1 Current Transformers for kWh and Demand Metering (Low Voltage)

2.25 WIRING DEVICES

PART 3 EXECUTION

3.1 GROUNDING

3.1.1 Ground Rods

3.1.2 Ground Bus

3.1.3 Grounding Conductors

3.2 WIRING METHODS

3.2.1 Conduit and Tubing Systems

3.2.1.1 Pull Wires

3.2.1.2 Conduit Stub-Ups

3.2.1.3 Below Slab-on-Grade or in the Ground

3.2.1.4 Installing in Slabs Including Slabs on Grade

3.2.1.5 Changes in Direction of Runs

3.2.1.6 Supports

3.2.1.7 Exposed Raceways

3.2.1.8 Exposed Risers

3.2.1.9 Communications Raceways

3.2.2 Cables and Conductors

3.2.2.1 Sizing

3.2.2.2 Use of Aluminum Conductors in Lieu of Copper

3.2.2.3 Cable Splicing

3.2.2.4 Conductor Identification and Tagging

3.3 BOXES AND SUPPORTS

3.3.1 Box Applications

3.3.2 Brackets and Fasteners

3.3.3 Mounting in Walls, Ceilings, or Recessed Locations

3.3.4 Installation in Overhead Spaces

3.4 DEVICE PLATES

3.5 RECEPTACLES

3.5.1 Single and Duplex, 15 or 20-ampere, 125 volt

3.5.2 Weatherproof Applications

3.5.2.1 Damp Locations

3.5.2.2 Wet Locations

3.5.3 Special-Purpose or Heavy-Duty Receptacles

3.6 WALL SWITCHES

3.7 SERVICE EQUIPMENT

3.8 DISTRIBUTION PANELS AND POWER PANELS

3.8.1 Distribution Panels

3.8.2 Lighting and Power Panels

3.9 FUSES

3.9.1 Cartridge Fuses; Current-Limiting Type

3.9.2 Motor and Transformer Circuit Fuses

3.10 UNDERGROUND SERVICE

3.11 MOTORS

3.12 MOTOR CONTROL

3.12.1 Contacts

3.12.2 Safety Controls

3.13 MOTOR-DISCONNECT MEANS

3.14 TRANSFORMER INSTALLATION

3.15 LIGHTING FIXTURES, LAMPS AND BALLASTS

3.15.1 Lamps

3.15.2 Lighting Fixtures

3.15.2.1 Accessories

3.15.2.2 Ceiling Fixtures

Grand Forks Phase 2 Levees

- 3.15.2.3 Suspended Fixtures
- 3.15.3 Emergency Light Sets
- 3.16 BATTERY CHARGERS
- 3.17 EQUIPMENT CONNECTIONS
  - 3.17.1 Motors and Motor Control
  - 3.17.2 Installation of Government-Furnished Equipment
- 3.18 CIRCUIT PROTECTIVE DEVICES
- 3.19 PAINTING AND FINISHING
- 3.20 REPAIR OF EXISTING WORK
- 3.21 FIELD TESTING
  - 3.21.1 Safety
  - 3.21.2 Ground-Resistance Tests
  - 3.21.3 Ground-Grid Connection Inspection
  - 3.21.4 Cable Tests
    - 3.21.4.1 Low Voltage Cable Tests
  - 3.21.5 Motor Tests
  - 3.21.6 Circuit Breaker Tests
    - 3.21.6.1 Circuit Breakers, Molded Case
  - 3.21.7 Protective Relays
- 3.22 OPERATING TESTS
- 3.23 ACCEPTANCE

-- End of Section Table of Contents --

SECTION 16415

ELECTRICAL WORK, INTERIOR

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

|               |  |
|---------------|--|
| ANSI C12.1    | (1995) Code for Electricity Metering   |
| ANSI C12.4    | (1984; R 1996) Mechanical Demand Registers   |
| ANSI C12.10   | (1997) Electromechanical Watthour Meters   |
| ANSI C12.11   | (1987; R 1993) Instrument Transformers for Revenue Metering, 10 kV BIL Through 350 kV BIL (0.6 kV NSV through 69 kV NSV) |
| ANSI C39.1    | (1981; R 1992) Requirements for Electrical Analog Indicating Instruments   |
| ANSI C78.1    | (1991; C78.1a; R 1996) Fluorescent Lamps - Rapid-Start Types - Dimensional and Electrical Characteristics                |
| ANSI C78.20   | (1995) Electric Lamps - Characteristics of Incandescent Lamps A, G, PS, and Similar Shapes with E26 Medium Screw Bases   |
| ANSI C78.21   | (1995) Physical and Electrical Characteristics - Incandescent Lamps - PAR and R Shapes                                   |
| ANSI C78.1350 | (1990) 400-Watt, 100-Volt, S51 Single-Ended High-Pressure Sodium Lamps   |
| ANSI C78.1351 | (1989) 250-Watt, 100-Volt S50 Single-Ended High-Pressure Sodium Lamps  |
| ANSI C78.1352 | (1990) 1000-Watt, 250-Volt, S52 Single-Ended High-Pressure Sodium Lamps  |
| ANSI C78.1355 | (1989) 150-Watt, 55-Volt S55 High-Pressure Sodium Lamps  |
| ANSI C78.1375 | (1996) 400-Watt, M59 Single-Ended Metal-Halide Lamps   |
| ANSI C78.1376 | (1996) 1000-Watt, M47 Single-Ended   |

Metal-Halide Lamps

|             |   |
|-------------|---|
| ANSI C78.2A | (1991) 18 & 26- Watt, Compact Fluorescent Quad Tube Lamps   |
| ANSI C78.2B | (1992) 9 & 13-Watt, Compact Fluorescent Quad Tube Lamps   |
| ANSI C82.1  | (1997) Specifications for Fluorescent Lamp Ballasts   |
| ANSI C82.4  | (1992) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type) |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|            |  |
|------------|--|
| ASTM B 1   | (1995) Hard-Drawn Copper Wire  |
| ASTM B 8   | (1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft |
| ASTM D 709 | (1992; R 1997) Laminated Thermosetting Materials                             |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

|           |   |
|-----------|---|
| 47 CFR 18 | Industrial, Scientific, and Medical Equipment |
|-----------|---|

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

|             |  |
|-------------|--|
| IEEE C57.13 | (1993) Instrument Transformers   |
| IEEE C62.41 | (1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits   |
| IEEE Std 81 | (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1) |

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

|            |   |
|------------|---|
| NEMA AB 1  | (1993) Molded Case Circuit Breakers and Molded Case Switches  |
| NEMA FU 1  | (1986) Low Voltage Cartridge Fuses  |
| NEMA ICS 1 | (1993) Industrial Control and Systems   |
| NEMA ICS 2 | (1993) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC |
| NEMA ICS 3 | (1993) Industrial Control and Systems Factory Built Assemblies  |

## Grand Forks Phase 2 Levees

|            |   |
|------------|---|
| NEMA ICS 6 | (1993) Industrial Control and Systems, Enclosures                                       |
| NEMA LE 4  | (1987) Recessed Luminaires, Ceiling Compatibility                                       |
| NEMA MG 1  | (1998) Motors and Generators  |
| NEMA MG 10 | (1994) Energy Management Guide for Selection and Use of Polyphase Motors                |
| NEMA OS 1  | (1996) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports                 |
| NEMA PB 1  | (1995) Panelboards  |
| NEMA ST 20 | (1992) Dry-Type Transformers for General Applications                                   |
| NEMA TC 2  | (1990) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80) |
| NEMA WD 1  | (1983; R 1989) General Requirements for Wiring Devices                                  |
| NEMA WD 6  | (1988) Wiring Devices - Dimensional Requirements  |

### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

|          |  |
|----------|--|
| NFPA 70  | (1999) National Electrical Code                |
| NFPA 101 | (1997; Errata 97-1; TIA 97-1) Life Safety Code |

### UNDERWRITERS LABORATORIES (UL)

|         |  |
|---------|--|
| UL 1    | (1993; Rev thru Jan 1995) Flexible Metal Conduit                 |
| UL 6    | (1997) Rigid Metal Conduit                                       |
| UL 20   | (1995; Rev thru Oct 1998) General-Use Snap Switches              |
| UL 50   | (1995; Rev thru Nov 1999) Enclosures for Electrical Equipment    |
| UL 67   | (1993; Rev thru Nov 1995) Panelboards                            |
| UL 83   | (1998; Rev thru Sep 99) Thermoplastic-Insulated Wires and Cables |
| UL 98   | (1994; Rev thru Jun 1998) Enclosed and Dead-Front Switches       |
| UL 198B | (1995) Class H Fuses   |

Grand Forks Phase 2 Levees

|         |  |
|---------|--|
| UL 198C | (1986; Rev thru Feb 1998)<br>High-Interrupting-Capacity Fuses,<br>Current-Limiting Types                           |
| UL 198D | (1995) Class K Fuses   |
| UL 198E | (1988; Rev Jul 1988) Class R Fuses   |
| UL 198G | (1988; Rev May 1988) Fuses for<br>Supplementary Overcurrent Protection   |
| UL 198H | (1988; Rev thru Nov 1993) Class T Fuses  |
| UL 360  | (1996; Rev thru Oct 1997) Liquid-Tight<br>Flexible Steel Conduit   |
| UL 467  | (1993; Rev thru Apr 1999) Grounding and<br>Bonding Equipment   |
| UL 486A | (1997; Rev thru Dec 1998) Wire Connectors<br>and Soldering Lugs for Use with Copper<br>Conductors                  |
| UL 486C | (1997; Rev thru Aug 1998) Splicing Wire<br>Connectors  |
| UL 486E | (1994; Rev thru Feb 1997) Equipment Wiring<br>Terminals for Use with Aluminum and/or<br>Copper Conductors          |
| UL 489  | (1996; Rev thru Dec 1998) Molded-Case<br>Circuit Breakers, Molded-Case Switches,<br>and Circuit-Breaker Enclosures |
| UL 506  | (1994; Rev Oct 1997) Specialty Transformers  |
| UL 508  | (1999) Industrial Control Equipment  |
| UL 510  | (1994; Rev thru Apr 1998) Polyvinyl<br>Chloride, Polyethylene, and Rubber<br>Insulating Tape                       |
| UL 512  | (1993; R Dec 1995) Fuseholders   |
| UL 514A | (1996; Rev Dec 1999) Metallic Outlet Boxes   |
| UL 514B | (1997; Rev Oct 1998) Fittings for Cable<br>and Conduit   |
| UL 542  | (1994; Rev thru Jul 1998) Lampholders,<br>Starters, and Starter Holders for<br>Fluorescent Lamps                   |
| UL 797  | (1993; Rev thru Mar 1997) Electrical<br>Metallic Tubing  |
| UL 817  | (1994; Rev thru Jul 1998) Cord Sets and<br>Power-Supply Cords  |

## Grand Forks Phase 2 Levees

|                   |   |
|-------------------|---|
| UL 845            | (1995; Rev Feb 1996) Motor Control Centers  |
| UL 869A           | (1998) Reference Standard for Service Equipment   |
| UL 877            | (1993; Rev thru May 1997) Circuit Breakers and Circuit-Breaker Enclosures for Use in Hazardous (Classified) Locations |
| UL 924            | (1995; Rev thru Oct 97) Emergency Lighting and Power Equipment  |
| UL 943            | (1993; Rev thru May 1998) Ground-Fault Circuit-Interrupters   |
| UL 1004           | (1994; Rev thru Dec 1997) Electric Motors   |
| UL 1022           | (1998) Line Isolation Monitors  |
| UL 1029           | (1994; Rev thru Dec 1997) High-Intensity-Discharge Lamp Ballasts  |
| UL 1047           | (1995; Rev Jul 1998) Isolated Power Systems Equipment   |
| UL 1242           | (1996; Rev Mar 1998) Intermediate Metal Conduit   |
| UL 1449           | (1996; Rev thru Oct 1998) Transient Voltage Surge Suppressors   |
| UL 1570           | (1995; Rev thru Jun 1997) Fluorescent Lighting Fixtures   |
| UL 1571           | (1995; Rev thru Jun 1997) Incandescent Lighting Fixtures  |
| UL 1572           | (1995; Rev thru Jun 1997) High Intensity Discharge Lighting Fixtures  |
| UL 1660           | (1994; Rev Apr 1998) Liquid-Tight Flexible Nonmetallic Conduit  |
| UL Elec Const Dir | (1998) Electrical Construction Equipment Directory  |

### 1.2 GENERAL

#### 1.2.1 Rules

The installation shall conform to the requirements of NFPA 70 and NFPA 101, unless more stringent requirements are indicated or shown.

#### 1.2.2 Coordination

The drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall become familiar with all details of the work and verify all dimensions in the field so that the outlets and equipment shall be properly located and readily accessible.

Lighting fixtures, outlets, and other equipment and materials shall be carefully coordinated with mechanical or structural features prior to installation and positioned according to architectural reflected ceiling plans; otherwise, lighting fixtures shall be symmetrically located according to the room arrangement when uniform illumination is required, or asymmetrically located to suit conditions fixed by design and shown. Raceways, junction and outlet boxes, and lighting fixtures shall not be supported from sheet metal roof decks. If any conflicts occur necessitating departures from the drawings, details of and reasons for departures shall be submitted and approved prior to implementing any change. The Contractor shall coordinate the electrical requirements of the mechanical work and provide all power related circuits, wiring, hardware and structural support, even if not shown on the drawings. The Contractor shall be responsible for installation, mounting, and connection of all Government-furnished equipment as specified and shown on drawings.

### 1.2.3 Special Environments

#### 1.2.3.1 Weatherproof Locations

Wiring, Fixtures, and equipment in designated locations shall conform to NFPA 70 requirements for installation in damp or wet locations.

#### 1.2.3.2 Ducts, Plenums and Other Air-Handling Spaces

Wiring and equipment in ducts, plenums and other air-handling spaces shall be installed using materials and methods in conformance with NFPA 70 unless more stringent requirements are indicated in this specification or on the contract drawings.

### 1.2.4 Standard Products

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

### 1.2.5 Nameplates

#### 1.2.5.1 Identification Nameplates

Major items of electrical equipment and major components shall be permanently marked with an identification name to identify the equipment by type or function and specific unit number as indicated. Designation of motors shall coincide with their designation in the motor control center or panel. Unless otherwise specified, identification nameplates shall be made of laminated plastic in accordance with ASTM D 709 with black outer layers and a white core. Edges shall be chamfered. Plates shall be fastened with black-finished round-head drive screws, except motors, or approved nonadhesive metal fasteners. When the nameplate is to be installed on an irregular-shaped object, the Contractor shall devise an approved support suitable for the application and ensure the proper installation of the supports and nameplates. In all instances, the nameplate shall be installed in a conspicuous location. At the option of the Contractor, the equipment manufacturer's standard embossed nameplate material with black paint-filled letters may be furnished in lieu of laminated plastic. The front of each panelboard, motor control center, switchgear, and switchboard shall have a nameplate to indicate the phase letter, corresponding color and arrangement of the phase conductors. The following equipment, as a



minimum, shall be provided with identification nameplates:

Minimum 1/4 inch  
High Letters

Minimum 1/8 inch  
High Letters

Panelboards  
Starters  
Safety Switches  
Motor Control Centers  
Transformers  
Equipment Enclosures  
Switchgear  
Switchboards  
Motors

Control Power Transformers  
Control Devices  
Instrument Transformers

Each panel, section, or unit in motor control centers, switchgear or similar assemblies shall be provided with a nameplate in addition to nameplates listed above, which shall be provided for individual compartments in the respective assembly, including nameplates which identify "future," "spare," and "dedicated" or "equipped spaces."

#### 1.2.6 As-Built Drawings

Following the project completion or turnover, within 30 days the Contractor shall furnish 2 sets of as-built drawings to the Contracting Officer.

#### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

##### SD-01 Data

Manufacturer's Catalog; GA.

Data composed of catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material, Equipment, and Fixture Lists; GA.

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each item.

As-Built Drawings; GA.

The as-built drawings shall be a record of the construction as installed. The drawings shall include all the information shown on the contract drawings, deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be kept at the job site and updated daily. The as-built drawings shall be a full-sized set of prints marked to reflect all deviations, changes, and modifications. The as-built drawings shall be complete and show the location, size, dimensions, part

identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall submit three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction.

The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within ten calendar days from the time the drawings are returned to the Contractor.

Onsite Tests; GA.

A detailed description of the Contractor's proposed procedures for on-site tests.

#### SD-04 Drawings

Interior Electrical Equipment; GA.

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams, and other information necessary to define the installation. Detail drawings shall show the rating of items and systems and how the components of an item and system are assembled, function together, and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission.

Multiple submissions for the same equipment or system are not acceptable except where prior approval has been obtained from the Contracting Officer. In such cases, a list of data to be submitted later shall be included with the first submission. Detail drawings shall show physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit or busway entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned. Optional items shall be clearly identified as included or excluded. Detail drawings shall as a minimum include:

- a. Transformers.
- b. Switchgear.
- c. Battery system including calculations for the battery and charger.
- d. Voltage regulators.
- e. Grounding resistors.
- f. Motors and rotating machinery.
- g. Motor control centers.
- h. Busway systems.

- i. Single line electrical diagrams including primary, metering, sensing and relaying, control wiring, and control logic.
- j. Sway bracing for suspended luminaires.

Structural drawings showing the structural or physical features of major equipment items, components, assemblies, and structures, including foundations or other types of supports for equipment and conductors. These drawings shall include accurately scaled or dimensioned outline and arrangement or layout drawings to show the physical size of equipment and components and the relative arrangement and physical connection of related components. Weights of equipment, components and assemblies shall be provided when required to verify the adequacy of design and proposed construction of foundations or other types of supports. Dynamic forces shall be stated for switching devices when such forces must be considered in the design of support structures. The appropriate detail drawings shall show the provisions for leveling, anchoring, and connecting all items during installation, and shall include any recommendations made by the manufacturer.

Electrical drawings including single-line and three-line diagrams, and schematics or elementary diagrams of each electrical system; internal wiring and field connection diagrams of each electrical device when published by the manufacturer; wiring diagrams of cabinets, panels, units, or separate mountings; interconnection diagrams that show the wiring between separate components of assemblies; field connection diagrams that show the termination of wiring routed between separate items of equipment; internal wiring diagrams of equipment showing wiring as actually provided for this project. Field wiring connections shall be clearly identified.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures, including changes in related portions of the project and the reasons why, shall be submitted with the detail drawings. Approved departures shall be made at no additional cost to the Government.

#### SD-09 Reports

Factory Test Reports; GA.

Six copies of the information described below in 8 1/2 x 11 inch binders having a minimum of 5 rings from which material may readily be removed and replaced, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The conditions specified for the test.

- f. The test results, signed and dated.
- g. A description of adjustments made.

Field Test Plan; GA.

A detailed description of the Contractor's proposed procedures for onsite test submitted 30 days prior to testing the installed system. No field test will be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

Field Test Reports; GA.

Six copies of the information described below in 8 1/2 x 11 inch binders having a minimum of 5 rings from which material may readily be removed and replaced, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The conditions specified for the test.
- f. The test results, signed and dated.
- g. A description of adjustments made.
- h. Final position of controls and device settings.

#### SD-13 Certificates

Materials and Equipment; GA.

The label or listing of the Underwriters Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements will be accepted. However, materials and equipment installed in hazardous locations must bear the UL label unless the data submitted from other testing agency is specifically approved in writing by the Contracting Officer. Items which are required to be listed and labeled in accordance with Underwriters Laboratories must be affixed with a UL label that states that it is UL listed. No exceptions or waivers will be granted to this requirement. Materials and equipment will be approved based on the manufacturer's published data.

For other than equipment and materials specified to conform to UL publications, a manufacturer's statement indicating complete compliance with the applicable standard of the American Society for Testing and Materials, National Electrical Manufacturers Association, or other commercial standard, is acceptable.

#### 1.4 WORKMANSHIP

Materials and equipment shall be installed in accordance with NFPA 70, recommendations of the manufacturer, and as shown.

### PART 2 PRODUCTS

Products shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

#### 2.1 CABLES AND WIRES

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise. Conductor sizes and ampacities shown are based on copper, unless indicated otherwise. All conductors shall be copper.

##### 2.1.1 Equipment Manufacturer Requirements

When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to meet manufacturer's requirements.

##### 2.1.2 Aluminum Conductors

Aluminum conductors shall not be used.

##### 2.1.3 Insulation

Unless indicated otherwise, or required by NFPA 70, power and lighting wires shall be 600-volt, Type XHHW or XHHW-2 conforming to UL 83, except that grounding wire may be type THHW conforming to UL 83; remote-control and signal circuits shall be Type THWN or XHHW, conforming to UL 83. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

##### 2.1.4 Bonding Conductors

ASTM B 1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B 8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

##### 2.1.5 Cord Sets and Power-Supply Cords

UL 817.

#### 2.2 TRANSIENT VOLTAGE SURGE PROTECTION

Transient voltage surge suppressors shall be provided as indicated. Surge suppressors shall meet the requirements of IEEE C62.41 and be UL listed and labeled as having been tested in accordance with UL 1449. Surge suppressor ratings shall be 480 volts rms, operating voltage; 60 Hz; 3-phase; 4 wire with ground; transient suppression voltage (peak let-through voltage) of 500 volts. Fuses shall not be used as surge suppression.

## 2.3 CIRCUIT BREAKERS

### 2.3.1 MOLDED-CASE CIRCUIT BREAKERS

Molded-case circuit breakers shall conform to NEMA AB 1 and UL 489 and UL 877 for circuit breakers and circuit breaker enclosures located in hazardous (classified) locations. Circuit breakers may be installed in panelboards, switchboards, enclosures, motor control centers, or combination motor controllers.

#### 2.3.1.1 Construction

Circuit breakers shall be suitable for mounting and operating in any position. Lug shall be listed for copper conductors only in accordance with UL 486E. Single-pole circuit breakers shall be full module size with not more than one pole per module. Multi-pole circuit breakers shall be of the common-trip type having a single operating handle such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multi-pole unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. All circuit breakers shall have a quick-make, quick-break overcenter toggle-type mechanism, and the handle mechanism shall be trip-free to prevent holding the contacts closed against a short-circuit or sustained overload. All circuit breaker handles shall assume a position between "ON" and "OFF" when tripped automatically. All ratings shall be clearly visible.

#### 2.3.1.2 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. The interrupting rating of the circuit breakers shall be at least equal to the available short-circuit current at the line terminals of the circuit breaker and correspond to the UL listed integrated short-circuit current rating specified for the panelboards and switchboards. Molded-case circuit breakers shall have nominal voltage ratings, maximum continuous-current ratings, and maximum short-circuit interrupting ratings in accordance with NEMA AB 1. Ratings shall be coordinated with system X/R ratio.

#### 2.3.1.3 Thermal-Magnetic Trip Elements

Thermal magnetic circuit breakers shall be provided as shown. Automatic operation shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. The instantaneous magnetic trip shall be adjustable and accessible from the front of all circuit breakers on frame sizes above 150 amperes.

### 2.3.2 Solid-State Trip Elements

Solid-state circuit breakers shall be provided as shown. All electronics

shall be self-contained and require no external relaying, power supply, or accessories. Printed circuit cards shall be treated to resist moisture absorption, fungus growth, and signal leakage. All electronics shall be housed in an enclosure which provides protection against arcs, magnetic interference, dust, and other contaminants. Solid-state sensing shall measure true RMS current with error less than one percent on systems with distortions through the 13th harmonic. Peak or average actuating devices are not acceptable. Current sensors shall be torodial construction, encased in a plastic housing filled with epoxy to protect against damage and moisture and shall be integrally mounted on the breaker. Where indicated on the drawings, circuit breaker frames shall be rated for 100 percent continuous duty. Circuit breakers shall have tripping features as shown on the drawings and as described below:

- a. Long-time current pick-up, adjustable from 50 percent to 100 percent of continuous current rating.
- b. Adjustable long-time delay.
- c. Short-time current pick-up, adjustable from 1.5 to 9 times long-time current setting.
- d. Adjustable short-time delay.
- e. Instantaneous current pick-up, adjustable from 1.5 to 9 times long-time current setting.
- f. Ground-fault pick-up, adjustable from 20 percent to 60 percent of sensor rating, but not greater than 1200 amperes. Sensing of ground-fault current at the main bonding jumper or ground strap will not be permitted.
- g. Adjustable ground-fault delay.
- h. Overload and ground-fault trip indicators shall be provided.

#### 2.3.3 SWD Circuit Breakers

Circuit breakers rated 15 or 20 amperes and intended to switch 277 volts or less fluorescent lighting loads shall be marked "SWD."

#### 2.3.4 HACR Circuit Breakers

Circuit breakers 60 amperes or below, 240 volts, 1-pole or 2-pole, intended to protect multi-motor and combination-load installations involved in heating, air conditioning, and refrigerating equipment shall be marked "Listed HACR Type."

#### 2.3.5 Ground Fault Circuit Interrupters

UL 943. Breakers equipped with ground fault circuit interrupters shall have ground fault class, interrupting capacity, and voltage and current ratings as indicated.

#### 2.4 MOTOR SHORT-CIRCUIT PROTECTOR (MSCP)

Motor short-circuit protectors shall conform to UL 508 and shall be provided as shown. Protectors shall be used only as part of a combination motor controller which provides coordinated motor branch-circuit overload

and short-circuit protection, and shall be rated in accordance with the requirements of NFPA 70.

#### 2.4.1 Construction

Motor short-circuit protector bodies shall be constructed of high temperature, dimensionally stable, long life, nonhygroscopic materials. Protectors shall fit special MSCP mounting clips and shall not be interchangeable with any commercially available fuses. Protectors shall have 100 percent one-way interchangeability within the A-Y letter designations. All ratings shall be clearly visible.

#### 2.4.2 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. Letter designations shall be A through Y for motor controller Sizes 0, 1, 2, 3, 4, and 5, with 100,000 amperes interrupting capacity rating. Letter designations shall correspond to controller sizes as follows:

| CONTROLLER SIZE | MSCP DESIGNATION |
|-----------------|------------------|
| NEMA 0          | A-N              |
| NEMA 1          | A-P              |
| NEMA 2          | A-S              |
| NEMA 3          | A-U              |
| NEMA 4          | A-W              |
| NEMA 5          | A-Y              |

#### 2.5 CONDUIT AND TUBING

##### 2.5.1 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797

##### 2.5.2 Electrical Plastic Tubing and Conduit

NEMA TC 2.

##### 2.5.3 Flexible Conduit, Steel and Plastic

General-purpose type, UL 1; liquid tight, UL 360, and UL 1660.

##### 2.5.4 Intermediate Metal Conduit

UL 1242.

##### 2.5.5 Rigid Metal Conduit

UL 6.

#### 2.6 CONDUIT AND DEVICE BOXES AND FITTINGS

##### 2.6.1 Boxes, Metallic Outlet



## Grand Forks Phase 2 Levees

NEMA OS 1 and UL 514A.

### 2.6.2 Boxes, Switch (Enclosed), Surface-Mounted

UL 98.

### 2.6.3 Fittings for Conduit and Outlet Boxes

UL 514B.

### 2.6.4 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing

UL 514B.

## 2.7 CONNECTORS, WIRE PRESSURE

### 2.7.1 For Use With Copper Conductors

UL 486A.

## 2.8 ELECTRICAL GROUNDING AND BONDING EQUIPMENT

UL 467.

### 2.8.1 Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length of the sectional type driven full length into the earth.

### 2.8.2 Ground Bus

The ground bus shall be bare copper conductor or flat copper in one piece, if practicable.

## 2.9 ENCLOSURES

NEMA ICS 6, unless otherwise specified. All equipment enclosures shall be NEMA 12 for indoor use and NEMA 4X for outdoor use.

### 2.9.1 Cabinets and Boxes

Cabinets and boxes with volume greater than 100 cubic inches shall be in accordance with UL 50, hot-dip, zinc-coated, if sheet steel.

### 2.9.2 Circuit Breaker Enclosures

UL 489.

## 2.10 LIGHTING FIXTURES, LAMPS, BALLASTS, EMERGENCY EQUIPMENT, CONTROLS AND ACCESSORIES

The following specifications are supported and supplemented by information and details on the drawings. Additional fixtures, if shown, shall conform to this specification. Lamps, lampholders, ballasts, transformers, electronic circuitry and other lighting system components shall be constructed according to industry standards. Equipment shall be tested and listed by a recognized independent testing laboratory for the expected installation conditions. Equipment shall conform to the standards listed

below. General descriptions of required fixtures can be found at <http://cadlib.wes.army.mil/html/detlib/gif/d502gif/D502262E.gif>. Fixture sheets are also attached at the end of this section.

#### 2.10.1 Lamps

Lamps shall be constructed to operate in the specified fixture, and shall function without derating life or output as listed in published data. Lamps shall meet the requirements of the Energy Policy Act of 1992.

- a. Incandescent and tungsten halogen lamps shall be designed for 125 volt operation (except for low voltage lamps), shall be rated for minimum life of 2,000 hours, and shall have color temperature between 2,800 and 3,200 degrees Kelvin. Tungsten halogen lamps shall incorporate quartz capsule construction. Lamps shall comply with ANSI C78.20 and sections 238 and 270 of ANSI C78.21.
- b. Fluorescent lamps shall have color temperature of 3,000 degrees Kelvin. They shall be designed to operate with the ballasts and circuitry of the fixtures in which they will be used. Fluorescent lamps, including spares, shall be manufactured by one manufacturer to provide for color and performance consistency. Fluorescent lamps shall comply with ANSI C78.1. Fluorescent tube lamp efficiencies shall meet or exceed the following requirements.

|                  |           |             |
|------------------|-----------|-------------|
| T8, 32 watts     | (4' lamp) | 2800 lumens |
| T12,34 watts     | (4' lamp) | 2800 lumens |
| T8,59 watts      | (8' lamp) | 5700 lumens |
| T12,60 watts     | (8' lamp) | 5600 lumens |
| T8/U,31-32 watts | (U-tube)  | 2600 lumens |
| T12/U,34 watts   | (U-tube)  | 2700 lumens |

(1) Linear fluorescent lamps, unless otherwise indicated, shall be 4 feet long 32 watt T8, 265 mA, with minimum CRI of 75. Lamps of other lengths or types shall be used only where specified or shown. Lamps shall deliver rated life when operated on rapid start ballasts.

(2) Small compact fluorescent lamps shall be twin, double, or triple tube configuration as shown with bi-pin or four-pin snap-in base and shall have minimum CRI of 85. They shall deliver rated life when operated on ballasts as shown. 9 and 13 watt double tube lamps shall comply with ANSI C78.2B. 18 and 26 watt double tube lamps shall comply with ANSI C78.2A. Minimum starting temperature shall be 32 degrees F for twin tube lamps and for double and triple twin tube lamps without internal starter; and 15 degrees F for double and triple twin tube lamps with internal starter.

- c. High intensity discharge lamps, including spares, shall be manufactured by one manufacturer in order to provide color and performance consistency. High intensity discharge lamps shall be designed to operate with the ballasts and circuitry of the fixtures in which they will be used and shall have wattage, shape and base as shown. High intensity discharge lamps, unless otherwise shown, shall have medium or mogul screw base and minimum

starting temperature of -20 degrees F. Metal halide lamps, unless otherwise shown, shall have minimum CRI of 65; color temperature of 4,300 degrees Kelvin; shall be -BU configuration if used in base-up position; and shall be -H or high output configuration if used in horizontal position. Lamps shall comply with all applicable ANSI C78.1350, ANSI C78.1351, ANSI C78.1352, ANSI C78.1355, ANSI C78.1375, and ANSI C78.1376.

#### 2.10.2 Ballasts and Transformers

Ballasts or transformers shall be designed to operate the designated lamps within their optimum specifications, without derating the lamps. Lamp and ballast combinations shall be certified as acceptable by the lamp manufacturer.

- a. Fluorescent ballasts shall comply with ANSI C82.1 and shall be mounted integrally within fluorescent fixture housing unless otherwise shown. Ballasts shall have maximum current crest factor of 1.7; high power factor; Class A sound rating; maximum operating case temperature of 77 degrees F above ambient; and shall be rated Class P. Unless otherwise indicated, the minimum number of ballasts shall be used to serve each individual fixture. A single ballast may be used to serve multiple fixtures if they are continuously mounted, identically controlled and factory manufactured for that installation with an integral wireway.

(1) Compact fluorescent ballasts shall comply with IEEE C62.41 Category A transient voltage variation requirements and shall be mounted integrally within compact fluorescent fixture housing unless otherwise shown. Ballasts shall have minimum ballast factor of 0.95; maximum current crest factor of 1.6; high power factor; maximum operating case temperature of 77 degrees F above ambient; shall be rated Class P; and shall have a sound rating of Class A. Ballasts shall meet FCC Class A specifications for EMI/RFI emissions. Ballasts shall operate from nominal line voltage of 120 volts at 60 Hz and maintain constant light output over a line voltage variation of 10%. Ballasts shall have an end-of-lamp-life detection and shut-down circuit. Ballasts shall be UL listed and shall contain no PCBs. Ballasts shall contain potting to secure PC board, provide lead strain relief, and provide a moisture barrier.

(2) Electronic fluorescent ballasts shall comply with 47 CFR 18 for electromagnetic interference. Ballasts shall withstand line transients per IEEE C62.41, Category A. Ballasts shall have total harmonic distortion between 10 and 20%; minimum frequency of 20,000Hz; filament voltage between 2.5 and 4.5 volts; maximum starting inrush current of 20 amperes; and shall comply with the minimum Ballast Efficacy Factors shown in the table below. Minimum starting temperature shall be 30 degrees F. Ballasts shall carry a manufacturer's full warranty of three years, including a minimum \$10 labor allowance per ballast.

#### ELECTRONIC FLUORESCENT BALLAST EFFICACY FACTORS

| LAMP<br>TYPE | TYPE OF<br>STARTER<br>& LAMP | NOMINAL<br>OPERATIONAL<br>VOLTAGE | NUMBER<br>OF<br>LAMPS | MINIMUM<br>BALLAST<br>EFFICACY |
|--------------|------------------------------|-----------------------------------|-----------------------|--------------------------------|
|--------------|------------------------------|-----------------------------------|-----------------------|--------------------------------|

## ELECTRONIC FLUORESCENT BALLAST EFFICACY FACTORS

## FACTOR

|        |          |              |   |      |
|--------|----------|--------------|---|------|
| 32W T8 | rapid    | 120 or 277 V | 1 | 2.54 |
|        | start    |              | 2 | 1.44 |
|        | linear & |              | 3 | 0.93 |
|        | U-tubes  |              | 4 | 0.73 |

---

- b. High intensity discharge ballasts shall comply with UL 1029 and, if multiple supply types, with ANSI C82.4. Ballasts shall have minimum ballast factor of 0.9; high power factor; Class A sound rating; and maximum operating case temperature of 77 degrees F above ambient.

(1) Electronic high intensity discharge ballasts shall be constant wattage autotransformer type; shall have less than 10% ballast loss; shall have total harmonic distortion between 10 and 20%; and shall have a minimum starting temperature of 0 degrees F.

(2) Magnetic high intensity discharge ballasts shall have a minimum starting temperature of -20 degrees F.

## 2.10.3 Fixtures

Fixtures shall be in accordance with the size, shape, appearance, finish, and performance shown. Unless otherwise indicated, lighting fixtures shall be provided with housings, junction boxes, wiring, lampholders, mounting supports, trim, hardware and accessories for a complete and operable installation. Recessed housings shall be minimum 20 gauge cold rolled or galvanized steel as shown. Extruded aluminum fixtures shall have minimum wall thickness of 0.125 inches. Plastic lenses shall be 100% virgin acrylic or as shown. Glass lenses shall be tempered. Heat resistant glass shall be borosilicate type. Conoid recessed reflector cones shall be Alzak with clear specular low iridescent finish.

- a. Incandescent fixtures shall comply with UL 1571. Incandescent fixture specular reflector cone trims shall be integral to the cone and shall be finished to match. Painted trim finishes shall be white with minimum reflectance of 88%. Low voltage incandescent fixtures shall have integral step-down transformers.
- b. Fluorescent fixtures shall comply with UL 1570. Recessed ceiling fixtures shall comply with NEMA LE 4. Fixtures shall be plainly marked for proper lamp and ballast type to identify lamp diameter, wattage, color and start type. Marking shall be readily visible to service personnel, but not visible from normal viewing angles. Fluorescent fixture lens frames on recessed and surface mounted troffers shall be one assembly with mitered corners. Parabolic louvers shall have a low iridescent finish and 45 degree cut-off. Louver intersection joints shall be hairline type and shall conceal mounting tabs or other assembly methods. Louvers shall be free from blemishes, lines or defects which distort the visual surface. Integral ballast and wireway compartments shall be easily accessible without the use of special tools. Housings shall be constructed to include grounding necessary to start the lamps. Open fixtures shall be equipped with a sleeve, wire guard, or other positive means to prevent lamps from falling. Medium bi-pin lampholders shall be twist-in type with positive locking

position. Long compact fluorescent fixtures and fixtures utilizing U-bend lamps shall have clamps or secondary lampholders to support the free ends of the lamps.

- c. High intensity discharge fixture shall comply with UL 1572. Recessed ceiling fixtures shall comply with NEMA LE 4. Reflectors shall be anodized aluminum. Fixtures for horizontal lamps shall have position oriented lampholders. Lampholders shall be pulse-rated to 5,000 volts. Fixtures indicated as classified or rated for hazardous locations or special service shall be designed and independently tested for the environment in which they are installed. Recessed lens fixtures shall have extruded aluminum lens frames. Ballasts shall be integral to fixtures and shall be accessible without the use of special tools. Remote ballasts shall be encased and potted. Lamps shall be shielded from direct view with a UV absorbing material such as tempered glass, and shall be circuited through a cut-off switch which will shut off the lamp circuit if the lens is not in place.
- d. Emergency lighting fixtures and accessories shall be constructed and independently tested to meet the requirements of applicable codes. Batteries shall be Nicad or equal with no required maintenance, and shall have a minimum life expectancy of five years and warranty period of three years.
- e. Exit Signs

Exit signs shall be ENERGY STAR compliant, thereby meeting the following requirements. Input power shall be less than 5 watts per face. Letter size and spacing shall adhere to NFPA 101. Luminance contrast shall be greater than 0.8. Average luminance shall be greater than 15 cd/ft<sup>2</sup> measured at normal (0 degree) and 45 degree viewing angles. Minimum luminance shall be greater than 8.6 cd/ft<sup>2</sup> measured at normal and 45 degree viewing angles. Maximum to minimum luminance shall be less than 20:1 measured at normal and 45 degree viewing angles. The manufacturer warranty for defective parts shall be at least 5 years.

#### 2.10.4 Lampholders, Starters, and Starter Holders

UL 542

#### 2.11 LOW-VOLTAGE FUSES AND FUSEHOLDERS

##### 2.11.1 Fuses, Low Voltage Cartridge Type

NEMA FU 1.

##### 2.11.2 Fuses, High-Interrupting-Capacity, Current-Limiting Type

Fuses, Class G, J, L and CC shall be in accordance with UL 198C.

##### 2.11.3 Fuses, Class K, High-Interrupting-Capacity Type

UL 198D.

##### 2.11.4 Fuses, Class H

UL 198B.

2.11.5 Fuses, Class R

UL 198E.

2.11.6 Fuses, Class T

UL 198H.

2.11.7 Fuses for Supplementary Overcurrent Protection

UL 198G.

2.11.8 Fuseholders

UL 512.

2.12 INSTRUMENTS, ELECTRICAL INDICATING

ANSI C39.1.

2.13 MOTORS, AC, FRACTIONAL AND INTEGRAL

Motors, ac, fractional and integral horsepower, 500 hp and smaller shall conform to NEMA MG 1 and UL 1004 for motors; NEMA MG 10 for energy management selection of polyphase motors. In addition to the standards listed above, motors shall be provided with efficiencies as specified in the table "MINIMUM NOMINAL EFFICIENCIES" below.

2.13.1 Rating

The horsepower rating of motors should be limited to no more than 125 percent of the maximum load being served unless a NEMA standard size does not fall within this range. In this case, the next larger NEMA standard motor size should be used.

2.13.2 Motor Efficiencies

All permanently wired polyphase motors of 1 hp or more shall meet the minimum full-load efficiencies as indicated in the following table, and as specified in this specification. Motors of 1 hp or more with open, drip proof or totally enclosed fan cooled enclosures shall be high efficiency type, unless otherwise indicated. Motor efficiencies indicated in the tables apply to general-purpose, single-speed, polyphase induction motors. Applications which require definite purpose, special purpose, special frame, or special mounted polyphase induction motors are excluded from these efficiency requirements. Motors provided as an integral part of motor driven equipment are excluded from this requirement if a minimum seasonal or overall efficiency requirement is indicated for that equipment by the provisions of another section.

MINIMUM NOMINAL MOTOR EFFICIENCIES  
OPEN DRIP PROOF MOTORS

| <u>k</u> | <u>1200 RP</u> | <u>1800 RP</u> | <u>3600 RPM</u> |
|----------|----------------|----------------|-----------------|
| 0.746    | 82.5           | 85.5           | 80.0            |
| 1.12     | 86.5           | 86.5           | 85.5            |
| 1.49     | 87.5           | 86.5           | 86.5            |
| 2.24     | 89.5           | 89.5           | 86.5            |

Grand Forks Phase 2 Levees

MINIMUM NOMINAL MOTOR EFFICIENCIES

|       |      |      |      |
|-------|------|------|------|
| 3.73  | 89.5 | 89.5 | 89.5 |
| 5.60  | 91.7 | 91.0 | 89.5 |
| 7.46  | 91.7 | 91.7 | 90.2 |
| 11.2  | 92.4 | 93.0 | 91.0 |
| 14.9  | 92.4 | 93.0 | 92.4 |
| 18.7  | 93.0 | 93.6 | 93.0 |
| 22.4  | 93.6 | 93.6 | 93.0 |
| 29.8  | 94.1 | 94.1 | 93.6 |
| 37.3  | 94.1 | 94.5 | 93.6 |
| 44.8  | 95.0 | 95.0 | 94.1 |
| 56.9  | 95.0 | 95.0 | 94.5 |
| 74.6  | 95.0 | 95.4 | 94.5 |
| 93.3  | 95.4 | 95.4 | 95.0 |
| 112.0 | 95.8 | 95.8 | 95.4 |
| 149.0 | 95.4 | 95.8 | 95.4 |
| 187.0 | 95.4 | 96.2 | 95.8 |
| 224.0 | 95.4 | 95.0 | 95.4 |
| 261.0 | 94.5 | 95.4 | 95.0 |
| 298.0 | 94.1 | 95.8 | 95.0 |
| 336.0 | 94.5 | 95.4 | 95.4 |
| 373.0 | 94.5 | 94.5 | 94.5 |

TOTALLY ENCLOSED FAN-COOLED MOTORS

| <u>k</u> | <u>1200 RP</u> | <u>1800 RP</u> | <u>3600 RPM</u> |
|----------|----------------|----------------|-----------------|
| 0.746    | 82.5           | 85.5           | 78.5            |
| 1.12     | 87.5           | 86.5           | 85.5            |
| 1.49     | 88.5           | 86.5           | 86.5            |
| 2.24     | 89.5           | 89.5           | 88.5            |
| 3.73     | 89.5           | 89.5           | 89.5            |
| 5.60     | 91.7           | 91.7           | 91.0            |
| 7.46     | 91.7           | 91.7           | 91.7            |
| 11.2     | 92.4           | 92.4           | 91.7            |
| 14.9     | 92.4           | 93.0           | 92.4            |
| 18.7     | 93.0           | 93.6           | 93.0            |
| 22.4     | 93.6           | 93.6           | 93.0            |
| 29.8     | 94.1           | 94.1           | 93.6            |
| 37.3     | 94.1           | 94.5           | 94.1            |
| 44.8     | 94.5           | 95.0           | 94.1            |
| 56.9     | 95.0           | 95.4           | 94.5            |
| 74.6     | 95.4           | 95.4           | 95.0            |
| 93.3     | 95.4           | 95.4           | 95.4            |
| 112.0    | 95.8           | 95.8           | 95.4            |
| 149.0    | 95.8           | 96.2           | 95.8            |
| 187.0    | 95.6           | 96.2           | 95.9            |
| 224.0    | 95.4           | 96.1           | 95.8            |
| 261.0    | 94.5           | 96.2           | 94.8            |
| 298.0    | 94.5           | 95.8           | 94.5            |
| 336.0    | 94.5           | 94.5           | 94.5            |
| 373.0    | 94.5           | 94.5           | 94.5            |

MINIMUM NOMINAL MOTOR EFFICIENCIES  
OPEN DRIP PROOF MOTORS

| <u>H</u> | <u>1200 RP</u> | <u>1800 RP</u> | <u>3600 RPM</u> |
|----------|----------------|----------------|-----------------|
| 1        | 82.5           | 85.5           | 80.0            |

# Grand Forks Phase 2 Levees

| TOTALLY ENCLOSED FAN-COOLED MOTORS |      |      |      |
|------------------------------------|------|------|------|
| 1.5                                | 86.5 | 86.5 | 85.5 |
| 2                                  | 87.5 | 86.5 | 86.5 |
| 3                                  | 89.5 | 89.5 | 86.5 |
| 5                                  | 89.5 | 89.5 | 89.5 |
| 7.5                                | 91.7 | 91.0 | 89.5 |
| 10                                 | 91.7 | 91.7 | 90.2 |
| 15                                 | 92.4 | 93.0 | 91.0 |
| 20                                 | 92.4 | 93.0 | 92.4 |
| 25                                 | 93.0 | 93.6 | 93.0 |
| 30                                 | 93.6 | 93.6 | 93.0 |
| 40                                 | 94.1 | 94.1 | 93.6 |
| 50                                 | 94.1 | 94.5 | 93.6 |
| 60                                 | 95.0 | 95.0 | 94.1 |
| 75                                 | 95.0 | 95.0 | 94.5 |
| 100                                | 95.0 | 95.4 | 94.5 |
| 125                                | 95.4 | 95.4 | 95.0 |
| 150                                | 95.8 | 95.8 | 95.4 |
| 200                                | 95.4 | 95.8 | 95.4 |
| 250                                | 95.4 | 96.2 | 95.8 |
| 300                                | 95.4 | 95.0 | 95.4 |
| 350                                | 94.5 | 95.4 | 95.0 |
| 400                                | 94.1 | 95.8 | 95.0 |
| 450                                | 94.5 | 95.4 | 95.4 |
| 500                                | 94.5 | 94.5 | 94.5 |

| TOTALLY ENCLOSED FAN-COOLED MOTORS |         |         |          |
|------------------------------------|---------|---------|----------|
| H                                  | 1200 RP | 1800 RP | 3600 RPM |
| 1                                  | 82.5    | 85.5    | 78.5     |
| 1.5                                | 87.5    | 86.5    | 85.5     |
| 2                                  | 88.5    | 86.5    | 86.5     |
| 3                                  | 89.5    | 89.5    | 88.5     |
| 5                                  | 89.5    | 89.5    | 89.5     |
| 7.5                                | 91.7    | 91.7    | 91.0     |
| 10                                 | 91.7    | 91.7    | 91.7     |
| 15                                 | 92.4    | 92.4    | 91.7     |
| 20                                 | 92.4    | 93.0    | 92.4     |
| 25                                 | 93.0    | 93.6    | 93.0     |
| 30                                 | 93.6    | 93.6    | 93.0     |
| 40                                 | 94.1    | 94.1    | 93.6     |
| 50                                 | 94.1    | 94.5    | 94.1     |
| 60                                 | 94.5    | 95.0    | 94.1     |
| 75                                 | 95.0    | 95.4    | 94.5     |
| 100                                | 95.4    | 95.4    | 95.0     |
| 125                                | 95.4    | 95.4    | 95.4     |
| 150                                | 95.8    | 95.8    | 95.4     |
| 200                                | 95.8    | 96.2    | 95.8     |
| 250                                | 95.6    | 96.2    | 95.9     |
| 300                                | 95.4    | 96.1    | 95.8     |
| 350                                | 94.5    | 96.2    | 94.8     |
| 400                                | 94.5    | 95.8    | 94.5     |
| 450                                | 94.5    | 94.5    | 94.5     |
| 500                                | 94.5    | 94.5    | 94.5     |

## 2.14 MOTOR CONTROLS AND MOTOR CONTROL CENTERS

### 2.14.1 General



NEMA ICS 1, NEMA ICS 2, NEMA ICS 3 and NEMA ICS 6, and UL 508 and UL 845. Panelboards supplying non-linear loads shall have neutrals sized for 200 percent of rated current.

#### 2.14.2 Motor Starters

Combination starters shall be provided with fusible switches.

#### 2.14.3 Thermal-Overload Protection

Each motor of 1/8 hp or larger shall be provided with thermal-overload protection. Polyphase motors shall have overload protection in each ungrounded conductor. The overload-protection device shall be provided either integral with the motor or controller, or shall be mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Single or double pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating not in excess of 80 percent of the switch rating.

#### 2.14.4 Low-Voltage Motor Overload Relays

##### 2.14.4.1 General

Thermal overload relays shall conform to NEMA ICS 2 and UL 508. Overload protection shall be provided either integral with the motor or motor controller, and shall be rated in accordance with the requirements of NFPA 70. Standard units shall be used for motor starting times up to 7 seconds. Quick trip units shall be used on hermetically sealed, submersible pumps, and similar motors.

##### 2.14.4.2 Construction

Manual reset type thermal relay shall be melting alloy construction. Automatic reset type thermal relays shall be bimetallic construction. Magnetic current relays shall consist of a contact mechanism and a dash pot mounted on a common frame.

##### 2.14.4.3 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. Trip current ratings shall be established by selection of the replaceable overload device and shall not be adjustable. Where the controller is remotely-located or difficult to reach, an automatic reset, non-compensated overload relay shall be provided. Manual reset overload relays shall be provided otherwise, and at all locations where automatic starting is provided. Where the motor is located in a constant ambient temperature, and the thermal device is located in an ambient temperature that regularly varies by more than minus 18 degrees F, an ambient temperature-compensated overload relay shall be provided.

#### 2.14.5 Automatic Control Devices

##### 2.14.5.1 Direct Control

Automatic control devices (such as thermostats, float or pressure switches) which control the starting and stopping of motors directly shall be designed for that purpose and have an adequate horsepower rating.

#### 2.14.5.2 Pilot-Relay Control

Where the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot-control circuit.

#### 2.14.5.3 Manual/Automatic Selection

- a. Where combination manual and automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch (marked MANUAL-OFF-AUTOMATIC) shall be provided for the manual control.
- b. Where combination manual and automatic control is specified and the automatic-control device actuates the pilot control circuit of a magnetic starter, the magnetic starter shall be provided with a three-position selector switch marked MANUAL-OFF-AUTOMATIC.
- c. Connections to the selector switch shall be such that; only the normal automatic regulatory control devices will be bypassed when the switch is in the Manual position; all safety control devices, such as low-or high-pressure cutouts, high-temperature cutouts, and motor-overload protective devices, shall be connected in the motor-control circuit in both the Manual and the Automatic positions of the selector switch. Control circuit connections to any MANUAL-OFF-AUTOMATIC switch or to more than one automatic regulatory control device shall be made in accordance with wiring diagram approved by the Contracting Officer unless such diagram is included on the drawings. All controls shall be 120 volts or less unless otherwise indicated.

#### 2.15 PANELBOARDS

Dead-front construction, NEMA PB 1 and UL 67.

#### 2.16 RECEPTACLES

##### 2.16.1 Heavy Duty Grade

NEMA WD 1. Devices shall conform to all requirements for heavy duty receptacles.

##### 2.16.2 Ground Fault Interrupters

UL 943, Class A or B.

##### 2.16.3 NEMA Standard Receptacle Configurations

NEMA WD 6.

- a. Single and Duplex, 15-Ampere and 20-Ampere, 125 Volt

15-ampere, non-locking: NEMA type 5-15R, locking: NEMA type L5-15R,  
20-ampere, non-locking: NEMA type 5-20R, locking: NEMA type L5-20R.

#### 2.17 Service Entrance Equipment

UL 869A.

2.18 SPLICE, CONDUCTOR

UL 486C.

2.19 SNAP SWITCHES

UL 20.

2.20 TAPES

2.20.1 Plastic Tape

UL 510.

2.20.2 Rubber Tape

UL 510.

2.21 TRANSFORMERS

Single- and three-phase transformers shall have two windings per phase. Full-capacity standard NEMA taps shall be provided in the primary windings of transformers unless otherwise indicated. Three-phase transformers shall be configured with delta-wye windings, except as indicated. "T" connections may be used for transformers rated 15 kVA or below. Transformers supplying non-linear loads shall be UL listed as suitable for supplying such loads with a total K-factor not to exceed K-13 and have neutrals sized for 200 percent of rated current.

2.21.1 Transformers, Dry-Type

Transformers shall have 220 degrees C insulation system for transformers 15 kVA and greater, and shall have 180 degrees C insulation system for transformers rated 10 kVA and less, with temperature rise not exceeding 150 degrees C under full-rated load in maximum ambient temperature of 40 degrees C. Transformer of 150 degrees C temperature rise shall be capable of carrying continuously 100 percent of nameplate kVA without exceeding insulation rating.

a. 600 Volt or Less Primary:

NEMA ST 20, UL 506, general purpose, dry-type, self-cooled, ventilated. Transformers shall be provided in NEMA 1 enclosure. Transformers shall be quiet type with maximum sound level at least 3 decibels less than NEMA standard level for transformer ratings indicated.

2.21.2 Average Sound Level

The average sound level in decibels (dB) of transformers shall not exceed the following dB level at 12 inches for the applicable kVA rating range listed unless otherwise indicated:

| kVA Range | dB Sound Level |
|-----------|----------------|
| 1-50      | 50             |
| 51-150    | 55             |
| 151-300   | 58             |
| 301-500   | 60             |

| kVA Range    | dB Sound Level |
|--------------|----------------|
| 501-700      | 62             |
| 701-1000     | 64             |
| 1001-1500    | 65             |
| 1501 & above | 70             |

## 2.22 ISOLATED POWER SYSTEM EQUIPMENT

UL 1047, with monitor UL 1022.

## 2.23 WATTHOUR METERS, UTILITY REVENUE

Watthour meters shall conform to ANSI C12.1 and ANSI C12.10, except numbered terminal wiring sequence and case size may be the manufacturer's standard. Watthour meters shall be of the socket-mounted outdoor type having a 15-minute, cumulative form, demand register meeting ANSI C12.4 and provided with not less than two and one-half staters. Watthour demand meters shall have factory-installed electronic pulse initiators meeting the requirements of ANSI C12.1. Pulse initiators shall be solid-state devices incorporating light-emitting diodes, phototransistors, and power transistors, except that mercury-wetted output contacts are acceptable. Initiators shall be totally contained within watthour demand meter enclosures, shall be capable of operating up to speeds of 500 pulses per minute with no false pulses, and shall require no field adjustments. Initiators shall be calibrated for a pulse rate output of one pulse per 1/4 disc revolution of the associated meter and shall be compatible with the indicated equipment.

## 2.24 INSTRUMENT TRANSFORMERS

### 2.24.1 General

Instrument transformers shall comply with ANSI C12.11 and IEEE C57.13. Instrument transformers shall be configured for mounting in/on the device to which they are applied. Polarity marks on instrument transformers shall be visually evident and shown on drawings.

### 2.24.2 Current Transformers

Unless otherwise indicated, bar, wound, or window-type transformers are acceptable; and except for window-type units installed over insulated buses, transformers shall have a BIL rating consistent with the rated BIL of the associated switchgear or electric power apparatus bushings, buses or conductors. Current transformers shall have the indicated ratios. The continuous thermal-current rating factor shall be not less than 2.0. Other thermal and mechanical ratings of current transformer and their primary leads shall be coordinated with the design of the circuit breaker and shall be not less than the momentary rating of the associated circuit breaker. Circuit protectors shall be provided across secondary leads of the current transformers to prevent the accidental open-circuiting of the transformers while energized. Each terminal of each current transformer shall be connected to a short-circuiting terminal block in the circuit interrupting mechanism cabinet, power transformer terminal cabinet, and in the associated instrument and relay cabinets.

#### 2.24.2.1 Current Transformers for kWH and Demand Metering (Low Voltage)

Current transformers shall conform to IEEE C57.13. Provide current

transformers with a metering accuracy Class of 0.3 through B-0.2, with a minimum RF of 3.0 for 300 ampere services, and a Class of 0.3 through B-0.2, with a minimum RF of 4.0 for 400 ampere services, and a Class of 0.3 through B-0.5, with a minimum RF of 3.0 for 600 ampere services, and a Class of 0.3 through B-0.5, with a minimum RF of 1.5 for 1200 ampere services at 30 degrees C, with 600-volt insulation, and 10 kV BIL. Provide butyl-molded, window-type current transformers mounted in the current transformer cabinet.

## 2.25 WIRING DEVICES

NEMA WD 1 for wiring devices, and NEMA WD 6 for dimensional requirements of wiring devices.

## PART 3 EXECUTION

### 3.1 GROUNDING

Grounding shall be in conformance with NFPA 70, the contract drawings, and the following specifications.

#### 3.1.1 Ground Rods

The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 81. The maximum resistance of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, 2 additional rods not less than 6 feet on centers, or if sectional type rods are used, 2 additional sections may be coupled and driven with the first rod. In high-ground-resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately. Connections below grade shall be fusion welded. Connections above grade shall be fusion welded or shall use UL 467 approved connectors.

#### 3.1.2 Ground Bus

Ground bus shall be provided in the electrical equipment rooms as indicated. Noncurrent-carrying metal parts of transformer neutrals and other electrical equipment shall be effectively grounded by bonding to the ground bus. The ground bus shall be bonded to both the entrance ground, and to a ground rod or rods as specified above having the upper ends terminating approximately 4 inches above the floor. Connections and splices shall be of the brazed, welded, bolted, or pressure-connector type, except that pressure connectors or bolted connections shall be used for connections to removable equipment.

#### 3.1.3 Grounding Conductors

A green equipment grounding conductor, sized in accordance with NFPA 70 shall be provided, regardless of the type of conduit. Equipment grounding bars shall be provided in all panelboards. The equipment grounding conductor shall be carried back to the service entrance grounding connection or separately derived grounding connection. All equipment grounding conductors, including metallic raceway systems used as such, shall be bonded or joined together in each wiring box or equipment enclosure. Metallic raceways and grounding conductors shall be checked to assure that they are wired or bonded into a common junction. Metallic boxes and enclosures, if used, shall also be bonded to these grounding

conductors by an approved means per NFPA 70. When switches, or other utilization devices are installed, any designated grounding terminal on these devices shall also be bonded to the equipment grounding conductor junction with a short jumper.

### 3.2 WIRING METHODS

Wiring shall conform to NFPA 70, the contract drawings, and the following specifications. Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid zinc-coated steel conduit. Wire fill in conduits shall be based on NFPA 70 for the type of conduit and wire insulations specified.

#### 3.2.1 Conduit and Tubing Systems

Conduit and tubing systems shall be installed as indicated. Conduit sizes shown are based on use of copper conductors with insulation types as described in paragraph WIRING METHODS. Minimum size of raceways shall be 3/4 inch. Only metal conduits will be permitted when conduits are required for shielding or other special purposes indicated, or when required by conformance to NFPA 70. Bushings, manufactured fittings or boxes providing equivalent means of protection shall be installed on the ends of all conduits and shall be of the insulating type, where required by NFPA 70. Only UL listed adapters shall be used to connect EMT to rigid metal conduit, cast boxes, and conduit bodies. Penetrations of above grade floor slabs, time-rated partitions and fire walls shall be firestopped in accordance with local codes and standards. Except as otherwise specified, IMC may be used as an option for rigid steel conduit in areas as permitted by NFPA 70. Raceways shall not be installed under the firepits of boilers and furnaces and shall be kept 6 inches away from parallel runs of flues, steam pipes and hot-water pipes. Raceways crossing structural expansion joints or seismic joints shall be provided with suitable expansion fittings or other suitable means to compensate for the building expansion and contraction and to provide for continuity of grounding. Wiring installed in underfloor raceway system shall be suitable for installation in wet locations.

##### 3.2.1.1 Pull Wires

A pull wire shall be inserted in each empty raceway in which wiring is to be installed if the raceway is more than 50 feet in length and contains more than the equivalent of two 90-degree bends, or where the raceway is more than 150 feet in length. The pull wire shall be of No. 14 AWG zinc-coated steel, or of plastic having not less than 200 pounds per square inch tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire.

##### 3.2.1.2 Conduit Stub-Ups

Where conduits are to be stubbed up through concrete floors, a short elbow shall be installed below grade to transition from the horizontal run of conduit to a vertical run. A conduit coupling fitting, threaded on the inside shall be installed, to allow terminating the conduit flush with the finished floor. Wiring shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used 6 inches above the floor. Empty or spare conduit stub-ups shall be plugged flush with the finished floor with a threaded, recessed plug.

##### 3.2.1.3 Below Slab-on-Grade or in the Ground

Electrical wiring below slab-on-grade shall be protected by a conduit system. Conduit passing vertically through slabs-on-grade shall be rigid steel or IMC. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system.

#### 3.2.1.4 Installing in Slabs Including Slabs on Grade

Conduit installed in slabs-on-grade shall be rigid steel or IMC. Conduits shall be installed as close to the middle of concrete slabs as practicable without disturbing the reinforcement. Outside diameter shall not exceed 1/3 of the slab thickness and conduits shall be spaced not closer than 3 diameters on centers except at cabinet locations where the slab thickness shall be increased as approved by the Contracting Officer. Where conduit is run parallel to reinforcing steel, the conduit shall be spaced a minimum of one conduit diameter away but not less than one inch from the reinforcing steel.

#### 3.2.1.5 Changes in Direction of Runs

Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment shall be prevented during the course of construction. Clogged raceways shall be cleared of obstructions or shall be replaced.

#### 3.2.1.6 Supports

Metallic conduits and tubing, and the support system to which they are attached, shall be securely and rigidly fastened in place to prevent vertical and horizontal movement at intervals of not more than 10 feet and within 3 feet of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, beam clamps, or ceiling trapeze. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structure. Loads shall not be applied to joist bridging. Attachment shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws. Raceways or pipe straps shall not be welded to steel structures. Cutting the main reinforcing bars in reinforced concrete beams or joists shall be avoided when drilling holes for support anchors. Holes drilled for support anchors, but not used, shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Raceways shall not be supported using wire or nylon ties. Raceways shall be independently supported from the structure. Upper raceways shall not be used as a means of support for lower raceways. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Cables and raceways shall not be supported by ceiling grids. Except where permitted by NFPA 70, wiring shall not be supported by ceiling support systems. Conduits shall be fastened to sheet-metal boxes and cabinets with two locknuts where required by NFPA 70, where insulating bushings are used,

and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered.

#### 3.2.1.7 Exposed Raceways

Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Raceways under raised floors and above accessible ceilings shall be considered as exposed installations in accordance with NFPA 70 definitions.

#### 3.2.1.8 Exposed Risers

Exposed risers in wire shafts of multistory buildings shall be supported by U-clamp hangers at each floor level, and at intervals not to exceed 10 feet.

#### 3.2.1.9 Communications Raceways

Communications raceways indicated shall be installed in accordance with the previous requirements for conduit and tubing and with the additional requirement that no length of run shall exceed 50 feet for 1/2 inch and 3/4 inch sizes, and 100 feet for 1 inch or larger sizes, and shall not contain more than two 90-degree bends or the equivalent. Additional pull or junction boxes shall be installed to comply with these limitations whether or not indicated. Inside radii of bends in conduits of 1 inch size or larger shall not be less than ten times the nominal diameter.

#### 3.2.2 Cables and Conductors

Installation shall conform to the requirements of NFPA 70. Covered, bare or insulated conductors of circuits rated over 600 volts shall not occupy the same equipment wiring enclosure, cable, or raceway with conductors of circuits rated 600 volts or less.

##### 3.2.2.1 Sizing

Unless otherwise noted, all sizes are based on copper conductors and the insulation types indicated. Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Conductors for branch circuits of 120 volts more than 100 feet long and of 277 volts more than 230 feet long, from panel to load center, shall be no smaller than No. 10 AWG. Class 1 remote control and signal circuit conductors shall be not less than No. 14 AWG. Class 2 remote control and signal circuit conductors shall be not less than No. 16 AWG. Class 3 low-energy, remote-control and signal circuits shall be not less than No. 22 AWG.

##### 3.2.2.2 Use of Aluminum Conductors in Lieu of Copper

Aluminum conductors shall not be used.

##### 3.2.2.3 Cable Splicing

Splices shall be made in an accessible location. Crimping tools and dies shall be approved by the connector manufacturer for use with the type of connector and conductor.

- a. Copper Conductors, 600 Volt and Under: Splices in conductors No. 10 AWG and smaller diameter shall be made with an insulated,



pressure-type connector. Splices in conductors No. 8 AWG and larger diameter shall be made with a solderless connector and insulated with tape or heat-shrink type insulating material equivalent to the conductor insulation.

#### 3.2.2.4 Conductor Identification and Tagging

Power, control, and signal circuit conductor identification shall be provided within each enclosure where a tap, splice, or termination is made.

Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation. Phase conductors of low voltage power circuits shall be identified by color coding. Phase identification by a particular color shall be maintained continuously for the length of a circuit, including junctions.

- a. Color coding shall be provided for service, feeder, branch, and ground conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in the same raceway or box, other neutral shall be white with colored (not green) stripe. The color coding for 3-phase and single-phase low voltage systems shall be as follows:

120/208-volt, 3-phase: Black(A), red(B), and blue(C).

277/480-volt, 3-phase: Brown(A), orange(B), and yellow(C).

120/240-volt, 1-phase: Black and red.

- b. Conductor phase and voltage identification shall be made by color-coded insulation for all conductors smaller than No. 6 AWG. For conductors No. 6 AWG and larger, identification shall be made by color-coded insulation, or conductors with black insulation may be furnished and identified by the use of half-lapped bands of colored electrical tape wrapped around the insulation for a minimum of 3 inches of length near the end, or other method as submitted by the Contractor and approved by the Contracting Officer.
- c. Control and signal circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved detail drawings. Hand lettering or marking is not acceptable.

#### 3.3 BOXES AND SUPPORTS

Boxes shall be provided in the wiring or raceway systems where required by NFPA 70 for pulling of wires, making connections, and mounting of devices or fixtures. Pull boxes shall be furnished with screw-fastened covers. Indicated elevations are approximate, except where minimum mounting heights for hazardous areas are required by NFPA 70. Unless otherwise indicated, boxes for wall switches and general purpose receptacles shall be mounted 48 inches above finished floors. Switch and outlet boxes located on opposite sides of fire rated walls shall be separated by a minimum horizontal distance of 24 inches. The total combined area of all box openings in fire rated walls shall not exceed 100 square inches per 100 square feet. Maximum box areas for individual boxes in fire rated walls vary with the

manufacturer and shall not exceed the maximum specified for that box in UL Elec Const Dir. Only boxes listed in UL Elec Const Dir shall be used in fire rated walls.

### 3.3.1 Box Applications

Each box shall have not less than the volume required by NFPA 70 for number of conductors enclosed in box. Boxes for metallic raceways shall be listed for the intended use when located in normally wet locations, when flush or surface mounted on outside of exterior surfaces, or when located in hazardous areas. Boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes for mounting lighting fixtures shall be not less than 4 inches square, or octagonal, except smaller boxes may be installed as required by fixture configuration, as approved. Cast-metal boxes with 3/32 inch wall thickness are acceptable and shall be used for all switches and receptacles. Large size boxes shall be NEMA 12 or as shown. Boxes in other locations shall be sheet steel when permitted by NFPA 70. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers.

### 3.3.2 Brackets and Fasteners

Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and metal expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screw or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws. Penetration of more than 1-1/2 inches into reinforced-concrete beams or more than 3/4 inch into reinforced-concrete joists shall avoid cutting any main reinforcing steel. The use of brackets which depend on gypsum wallboard or plasterboard for primary support will not be permitted. In partitions of light steel construction, bar hangers with 1 inch long studs, mounted between metal wall studs or metal box mounting brackets shall be used to secure boxes to the building structure. When metal box mounting brackets are used, additional box support shall be provided on the side of the box opposite the brackets. This additional box support shall consist of a minimum 12 inch long section of wall stud, bracketed to the opposite side of the box and secured by two screws through the wallboard on each side of the stud. Metal screws may be used in lieu of the metal box mounting brackets.

### 3.3.3 Mounting in Walls, Ceilings, or Recessed Locations

In walls or ceilings of concrete, tile, or other non-combustible material, boxes shall be installed so that the edge of the box is not recessed more than 1/4 inch from the finished surface. Boxes mounted in combustible walls or ceiling material shall be mounted flush with the finished surface. The use of gypsum or plasterboard as a means of supporting boxes will not be permitted. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. The bottom of boxes installed in masonry-block walls for concealed wiring shall be mounted flush with the top of a block to minimize cutting of the blocks, and boxes shall be located horizontally to avoid cutting webs of block. Separate boxes shall be provided for flush or recessed fixtures when required by the fixture terminal operating temperature, and fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided.

### 3.3.4 Installation in Overhead Spaces

In open overhead spaces, cast-metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast-metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Hangers shall not be fastened to or supported from joist bridging. Where bar hangers are used, the bar shall be attached to raceways on opposite sides of the box and the raceway shall be supported with an approved type fastener not more than 24 inches from the box.

### 3.4 DEVICE PLATES

One-piece type device plates shall be provided for all outlets and fittings. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel, cast-metal. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified.

### 3.5 RECEPTACLES

#### 3.5.1 Single and Duplex, 15 or 20-ampere, 125 volt

Single and duplex receptacles shall be extra hard use specification grade, rated 20 amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be of gray to match color of switch handles in the same room, and supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side-wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke. Switched receptacles shall be the same as other receptacles specified except that the ungrounded pole of each suitable receptacle shall be provided with a separate terminal. Only the top receptacle of a duplex receptacle shall be wired for switching application. Receptacles with ground fault circuit interrupters shall have the current rating as indicated, and shall be UL Class A type unless otherwise shown. Ground fault circuit protection shall be provided as required by NFPA 70 and as indicated on the drawings.

#### 3.5.2 Weatherproof Applications

Weatherproof receptacles shall be suitable for the environment, damp or wet as applicable, and the housings shall be labeled to identify the allowable use. Receptacles shall be marked in accordance with UL 514A for the type of use indicated; "Damp locations", "Wet Locations", "Wet Location Only When Cover Closed". Assemblies shall be installed in accordance with the manufacturer's recommendations.

##### 3.5.2.1 Damp Locations

Receptacles in damp locations shall be mounted in an outlet box with a gasketed, weatherproof, cast-metal cover plate (device plate, box cover) and a gasketed cap (hood, receptacle cover) over each receptacle opening.

The cap shall be either a screw-on type permanently attached to the cover plate by a short length of bead chain or shall be a flap type attached to the cover with a spring loaded hinge.

#### 3.5.2.2 Wet Locations

Receptacles in wet locations shall be installed in an assembly rated for such use whether the plug is inserted or withdrawn, unless otherwise indicated. In a duplex installation, the receptacle cover shall be configured to shield the connections whether one or both receptacles are in use.

#### 3.5.3 Special-Purpose or Heavy-Duty Receptacles

Special-purpose or heavy-duty receptacles shall be of the type and of ratings and number of poles indicated or required for the anticipated purpose. Contact surfaces may be either round or rectangular. One appropriate straight or angle-type plug shall be furnished with each receptacle. Locking type receptacles, rated 30 amperes or less, shall be locked by rotating the plug. Locking type receptacles, rated more than 50 amperes, shall utilize a locking ring.

#### 3.6 WALL SWITCHES

Wall switches shall be specification grade, fast-make, positive break, snap switches with grounding terminal. The wall switch handle and switch plate color shall be gray. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than two switches shall be installed in a single-gang position. Switches shall be rated 20-ampere 120-volt for use on alternating current only. Pilot lights indicated shall consist of yoke-mounted candelabra-base sockets rated at 75 watts, 125 volts, and fitted with glass or plastic jewels. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be green, and jewels for other purposes shall be red.

#### 3.7 SERVICE EQUIPMENT

Service-disconnecting means shall be of the enclosed molded-case circuit breaker type with an external handle for manual operation. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated.

#### 3.8 DISTRIBUTION PANELS AND POWER PANELS

Circuit breakers and switches used as a motor disconnecting means shall be capable of being locked in the open position. Door locks shall be keyed alike. Nameplates shall be as approved. Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering. Busses shall be copper.

##### 3.8.1 Distribution Panels

Quantity and identification shall be as shown on drawings. Distribution panels shall be in accordance with UL 67 and NEMA PB 1. Panels will be of a Dead-front construction, with molded case circuit breakers, and be surface mounted. Distribution panels will be rated for 480Y/277 volts ac, 3-phase, 4 wire, with a main bus capacity of 600 or 1200 amperes, as shown on the

drawings, and a neutral bus capacity of 150 percent of the main bus. Busses will be of copper construction. Distribution panels will be equipped with bolt-on, enclosed thermal-magnetic protective, quick make, quick break, trip indicating, circuit breakers, with a rating of 14,000 symmetrical amperes at 277 volts.

### 3.8.2 Lighting and Power Panels

Quantity and identification shall be as shown on drawings. Lighting and power panels shall be in accordance with UL 67 and NEMA PB 1. Panels will be of a dead-front construction, with molded case circuit breakers, and be surface mounted. Lighting and power panels will be rated for the voltage and phasing, as shown on the drawings, and a neutral bus capacity of 150 percent of the main bus. Busses will be of copper construction. Lighting and power panels will be equipped with bolt-on, enclosed thermal-magnetic protective, quick make, quick break, trip indicating, circuit breakers, with a rating of 10,000 symmetrical amperes at 240 volts.

### 3.9 FUSES

Equipment provided under this contract shall be provided with a complete set of properly rated fuses when the equipment manufacturer utilize fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination. Time-delay and non-time-delay options shall be as specified.

#### 3.9.1 Cartridge Fuses; Current-Limiting Type

Cartridge fuses, current-limiting type, Class RK1 shall have tested interrupting capacity not less than 200,000 amperes. Fuse holders shall be the type that will reject all Class H fuses.

#### 3.9.2 Motor and Transformer Circuit Fuses

Motor, motor controller, transformer, and inductive circuit fuses shall be Class RK1 or RK5, current-limiting, time-delay with 200,000 amperes interrupting capacity.

### 3.10 UNDERGROUND SERVICE

Unless otherwise indicated, interior conduit systems shall be stubbed out 5 feet beyond the building wall and 2 feet below finished grade, for interface with the exterior service lateral conduits. Outside conduit ends shall be bushed when used for direct burial service lateral conductors. Outside conduit ends shall be capped or plugged until connected to exterior conduit systems. Contractor shall provide and install exterior, underground, conduit and cable system, from building service disconnect to secondary side of Utility provided transformer. All service cable and conduit will be installed and terminated in accordance with the requirements of NFPA 70. Contractor shall be responsible for all costs associated with establishing required services. Contractor shall be responsible for all costs associated with relocation or termination of existing services, for construction of the levee system.

### 3.11 MOTORS

Each motor shall conform to the hp and voltage ratings indicated, and shall have a service factor and other characteristics that are essential to the proper application and performance of the motors under conditions shown or specified. Three-phase motors for use on 3-phase 208-volt systems shall have a nameplate rating of 200 volts. Unless otherwise specified, all motors shall have open frames, and continuous-duty classification based on a 40 degree C ambient temperature reference. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics, unless other characteristics are specified in other sections of these specifications or shown on contract drawings. The Contractor shall be responsible for selecting the actual horsepower ratings and other motor requirements necessary for the applications indicated. When electrically driven equipment furnished under other sections of these specifications materially differs from the design, the Contractor shall make the necessary adjustments to the wiring, disconnect devices and branch-circuit protection to accommodate the equipment actually installed.

### 3.12 MOTOR CONTROL

Each motor or group of motors requiring a single control shall be provided under other sections of these specifications with a suitable controller and devices that will perform the functions as specified for the respective motors. Each motor of 1/8 hp or larger shall be provided with thermal-overload protection. Polyphase motors shall have overload protection in each ungrounded conductor. The overload-protection device shall be provided either integral with the motor or controller, or shall be mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Single or double pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating not in excess of 80 percent of the switch rating. Automatic control devices such as thermostats, float or pressure switches may control the starting and stopping of motors directly, provided the devices used are designed for that purpose and have an adequate horsepower rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot-control circuit. When combination manual and automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch shall be provided for the manual control; when the automatic-control device actuates the pilot control circuit of a magnetic starter, the latter shall be provided with a three-position selector switch marked MANUAL-OFF-AUTOMATIC. Connections to the selector switch shall be such that only the normal automatic regulatory control devices will be bypassed when the switch is in the Manual position; all safety control devices, such as low- or high-pressure cutouts, high-temperature cutouts, and motor-overload protective devices, shall be connected in the motor-control circuit in both the Manual and the Automatic positions of the selector switch. Control circuit connections to any MANUAL-OFF-AUTOMATIC switch or to more than one automatic regulatory control device shall be made in accordance with wiring diagram approved by the Contracting Officer unless such diagram is included on the drawings. All controls shall be 120 volts or less unless otherwise indicated.

#### 3.12.1 Contacts

Unless otherwise indicated, contacts in miscellaneous control devices such

as float switches, pressure switches, and auxiliary relays shall have current and voltage ratings in accordance with NEMA ICS 2 for rating designation B300.

### 3.12.2 Safety Controls

Safety controls for boilers shall be connected to a 2-wire, 120 volt grounded circuit supplied from the associated boiler-equipment circuit. Where the boiler circuit is more than 120 volts to ground, safety controls shall be energized through a two-winding transformer having its 120 volt secondary winding grounded. Overcurrent protection shall be provided in the ungrounded secondary conductor and shall be sized for the load encountered.

### 3.13 MOTOR-DISCONNECT MEANS

Each motor shall be provided with a disconnecting means when required by NFPA 70 even though not indicated. For single-phase motors, a single or double pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Switches shall disconnect all ungrounded conductors.

### 3.14 TRANSFORMER INSTALLATION

Three-phase transformers shall be connected only in a delta-wye configuration as indicated. "T" connections may be used for transformers rated at 15 kVA or below. Dry-type transformers shown located within 5 feet of the exterior wall shall be provided in a weatherproof enclosure. Transformers to be located within the building may be provided in the manufacturer's standard, ventilated indoor enclosure designed for use in 40 degrees C ambient temperature, unless otherwise indicated.

### 3.15 LIGHTING FIXTURES, LAMPS AND BALLASTS

This paragraph shall cover the installation of lamps, lighting fixtures and ballasts in interior or building mounted applications.

#### 3.15.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed just prior to project completion. Lamps installed and used for working light during construction shall be replaced prior to turnover to the Government if more than 15% of their rated life has been used. Lamps shall be tested for proper operation prior to turn-over and shall be replaced if necessary with new lamps from the original manufacturer. 10% spare lamps of each type, from the original manufacturer, shall be provided.

#### 3.15.2 Lighting Fixtures

Fixtures shall be as shown and shall conform to the following specifications and shall be as detailed on the drawings. Illustrations shown on the drawings are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equivalent energy efficiency, light distribution and brightness characteristics, and of equal finish and quality will be acceptable if approved. In suspended acoustical ceilings with fluorescent fixtures, the fluorescent emergency light

fixtures shall be furnished with self-contained battery packs.

#### 3.15.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

#### 3.15.2.2 Ceiling Fixtures

Ceiling fixtures shall be coordinated with and suitable for installation in, on or from the ceiling as shown. Installation and support of fixtures shall be in accordance with NFPA 70 and manufacturer's recommendations. Where seismic requirements are specified herein, fixtures shall be supported as shown or specified. Recessed fixtures shall have adjustable fittings to permit alignment with ceiling panels. Recessed fixtures installed in fire-resistive ceiling construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling, in conformance with UL Elec Const Dir. Surface-mounted fixtures shall be suitable for fastening to the ceiling panel structural supports.

#### 3.15.2.3 Suspended Fixtures

Suspended fixtures shall be provided with swivel hangers or hand-strights so that they hang plumb. Pendants, rods, or chains 4 feet or longer excluding fixture shall be braced to prevent swaying using three cables at 120 degrees of separation. Suspended fixtures in continuous rows shall have internal wireway systems for end to end wiring and shall be properly aligned to provide a straight and continuous row without bends, gaps, light leaks or filler pieces. Aligning splines shall be used on extruded aluminum fixtures to assure hairline joints. Steel fixtures shall be supported to prevent "oil-canning" effects. Fixture finishes shall be free of scratches, nicks, dents, and warps, and shall match the color and gloss specified. Pendants shall be finished to match fixtures. Aircraft cable shall be stainless steel. Canopies shall be finished to match the ceiling and shall be low profile unless otherwise shown. Maximum distance between suspension points shall be 10 feet or as recommended by the manufacturer, whichever is less.

Suspended fixtures installed in seismic areas shall have 45% swivel hangers and shall be located with no obstructions within the 45% range in all directions. The stem, canopy and fixture shall be capable of 45% swing.

#### 3.15.3 Emergency Light Sets

Emergency light sets shall conform to UL 924 with the number of heads as indicated. Sets shall be permanently connected to the wiring system by conductors installed in short lengths of flexible conduit.

#### 3.16 BATTERY CHARGERS

Battery chargers shall be installed in conformance with NFPA 70.

#### 3.17 EQUIPMENT CONNECTIONS

Wiring not furnished and installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements



of paragraph WIRING METHODS. Flexible conduits 6 feet or less in length shall be provided to all electrical equipment subject to periodic removal, vibration, or movement and for all motors. All motors shall be provided with separate grounding conductors. Liquid-tight conduits shall be used in damp or wet locations.

#### 3.17.1 Motors and Motor Control

Motors, motor controls, and motor control centers shall be installed in accordance with NFPA 70, the manufacturer's recommendations, and as indicated. Wiring shall be extended to motors, motor controls, and motor control centers and terminated.

#### 3.17.2 Installation of Government-Furnished Equipment

Contractor shall be responsible for installation and connection of all Government-furnished equipment. This includes installation and mounting, connection of power and control wiring, and all required interconnections. Government-furnished equipment shall include, but not be limited to the following:

- a. Electrical generator.
- b. Automatic transfer switch.
- c. Pump motor controller.
- d. Pump motor starters.
- e. Pump motors.
- f. Level indicators.
- g. SCADA system.

#### 3.18 CIRCUIT PROTECTIVE DEVICES

The Contractor shall calibrate, adjust, set and test each new adjustable circuit protective device to ensure that they will function properly prior to the initial energization of the new power system under actual operating conditions.

#### 3.19 PAINTING AND FINISHING

Field-applied paint on exposed surfaces shall be provided under Section 09900 PAINTING, GENERAL.

#### 3.20 REPAIR OF EXISTING WORK

The work shall be carefully laid out in advance, and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceiling, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to building, piping, or equipment shall be repaired by skilled mechanics of the trades involved at no additional cost to the Government.

#### 3.21 FIELD TESTING

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 30 days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspection recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. All field test reports will be signed and dated by the Contractor.

#### 3.21.1 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

#### 3.21.2 Ground-Resistance Tests

The resistance of the grounding grid shall be measured using the fall-of-potential method defined in IEEE Std 81. Soil resistivity in the area of the grid shall be measured concurrently with the grid measurements.

Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

a. Single rod electrode - 25 ohms.

b. Grid electrode - 5 ohms.

#### 3.21.3 Ground-Grid Connection Inspection

All below-grade ground-grid connections will be visually inspected by the Contracting Officer before backfilling. The Contractor shall notify the Contracting Officer 96 hours before the site is ready for inspection.

#### 3.21.4 Cable Tests

The Contractor shall be responsible for identifying all equipment and devices that could be damaged by application of the test voltage and ensuring that they have been properly disconnected prior to performing insulation resistance testing. An insulation resistance test shall be performed on all low and medium voltage cables after the cables are installed in their final configuration and prior to energization. The test voltage shall be 500 volts DC applied for one minute between each conductor and ground and between all possible combinations of conductors. The minimum value of resistance shall be:

$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet})$

Each cable failing this test shall be repaired or replaced. The repaired cable system shall then be retested until failures have been eliminated.

##### 3.21.4.1 Low Voltage Cable Tests

- a. Continuity test.
- b. Insulation resistance test.

#### 3.21.5 Motor Tests

- a. Phase rotation test to ensure proper directions.
- b. High potential test on each winding to ground.
- c. Insulation resistance of each winding to ground.

#### 3.21.6 Circuit Breaker Tests

The following field tests shall be performed on circuit breakers.

##### 3.21.6.1 Circuit Breakers, Molded Case

- a. Insulation resistance test phase-to-phase, all combinations.
- b. Insulation resistance test phase-to-ground, each phase.
- c. Closed breaker contact resistance test.
- d. Manual operation of the breaker.

#### 3.21.7 Protective Relays

Protective relays shall be visually and mechanically inspected, adjusted, tested, and calibrated in accordance with the manufacturer's published instructions. These tests shall include pick-up, timing, contact action, restraint, and other aspects necessary to insure proper calibration and operation. Relay settings shall be implemented in accordance with the coordination study. Relay contacts shall be manually or electrically operated to verify that the proper breakers and alarms initiate. Relaying current transformers shall be field tested in accordance with IEEE C57.13.

#### 3.22 OPERATING TESTS

After the installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the specified requirements. An operating test report shall be submitted in accordance with paragraph FIELD TEST REPORTS.

#### 3.23 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

-- End of Section --

CORPS OF ENGINEERS

DEPARTMENT OF THE ARMY

TYPE: PF6

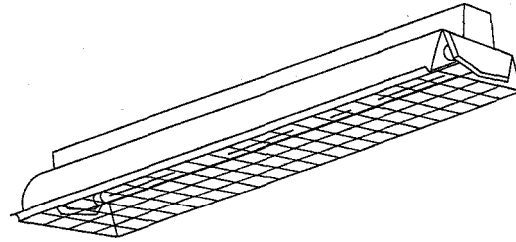
**FEATURES**

LAMP TYPE: F32T8/75 CRI

PROFILE: 2 LAMP

SHIELDING: WIRE GUARD

BALLAST: ELECTRONIC



**OPTIONS**

PROFILE: 3 LAMP

MOUNTING: SURFACE

BALLAST: HIGH POWER FACTOR  
MAGNETIC, EMERGENCY

NOM. DIMENSIONS 178 mm X 356 mm X 1219 mm  
(7" H X 14" W X 4' L)

**GENERAL DESCRIPTION**

HOUSING: DIE-FORMED CRS HOUSING WITH ROLLED SYMMETRIC  
REFLECTOR/BALLAST COVER

REFLECTORS: COLD ROLLED STEEL, PAINTED WHITE, 10% UPLIGHT APERTURES

ELECTRICAL: 120 OR 277 VOLT BALLAST

FINISH: WHITE ENAMEL POLYESTER POWDER COAT

CHAIN HUNG 4' TURRET INDUSTRIAL  
FLUORESCENT

TYPE: EH5

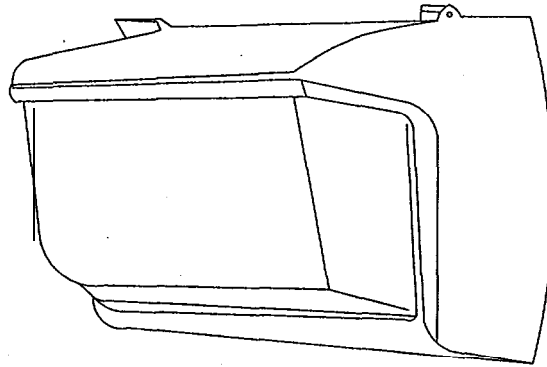
FEATURES

LAMP TYPE: 70W METAL HALIDE

PROFILE: 1 LAMP

SHIELDING: PRISMATIC BOROSILICATE  
GLASS

BALLAST: HIGH POWER FACTOR,  
CORE & COIL, CWA



OPT-IONS

LAMP TYPE: MH: 100W, 175W

HPS: 70W, 100W, 150W

SHIELDING: POLYCARBONATE

OTHER: PHOTOCELL CONTROL

NOM. DIMENSIONS 311 mm X 241 mm X 184 mm

(12<sup>1</sup>/<sub>4</sub>" L X 9<sup>1</sup>/<sub>2</sub>" H X 7<sup>1</sup>/<sub>4</sub>" D)

GENERAL DESCRIPTION

HOUSING: DIE CAST ALUMINUM HOUSING, DOOR ASSEMBLY AND BACKPLATE

MOUNTING: DIE CAST ALUMINUM BACKPLATE WITH CAST-IN KNOCKOUTS FOR  
MOUNTING HOLE ALIGNMENT.

REFLECTORS: SPECULAR ANODIZED ALUMINUM

ELECTRICAL: 120, 277, 208, 240, 347 & 480 VOLT MULTI TAP BALLAST

FINISH: BAKED-ON POLYURETHANE POWDER COAT PAINT

METAL HALIDE WALL PAK

CORPS OF ENGINEERS

DEPARTMENT OF THE ARMY

TYPE: XL1

FEATURES

LAMP TYPE: LED

MOUNTING: UNIVERSAL

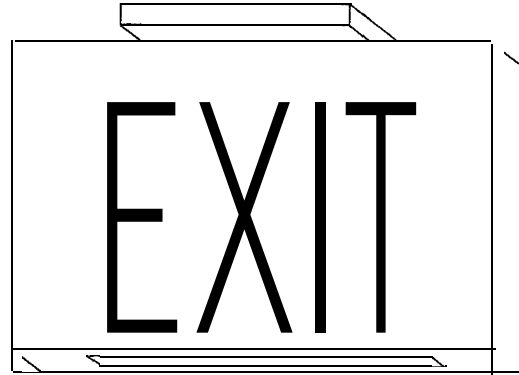
SHIELDING: FLAT SHEET ACRYLIC

LETTERS: GREEN

OPTIONS

LETTERS: RED

OTHER: BRUSHED ALUMINUM,  
WHITE AND BRONZE



NOM. DIMENSIONS 289 mm X 200 mm X 44 mm  
(11<sup>3</sup>/<sub>8</sub>" W X 7<sup>7</sup>/<sub>8</sub>" H X 1<sup>3</sup>/<sub>4</sub>" D)

GENERAL DESCRIPTION

HOUSING: DIE-CAST ALUMINUM OR 20 GA. COLD ROLLED STEEL, HARDWARE  
FINISH TO MATCH HOUSING FINISH. 152 mm (6") H LETTERS  
WITH 19 mm (3/4") STROKE. DIRECTIONAL ARROWS AS  
REQUIRED

ELECTRICAL: 120 OR 277 VOLT

FINISH: BLACK

OTHER: MINIMUM BRIGHTNESS. 20 CD/SQ METER ON FACE OF SIGN.

LED STENCIL FACE EXIT SIGN

CORPS OF ENGINEERS

DEPARTMENT OF THE ARMY

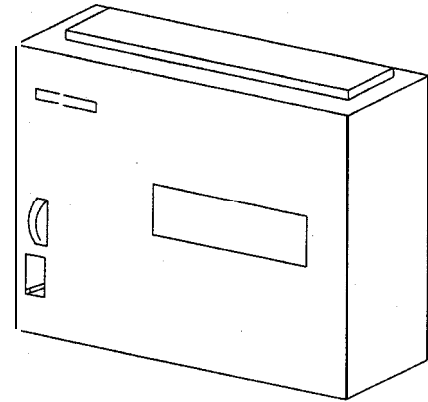
TYPE: XII

FEATURES

BATTERY: SEALED LEAD CALCIUM, 3  
YEAR

OPTIONS

BATTERY: SEALED LONG LIFE, 5  
YEAR  
SEALED NICKEL CADMIUM



NOM. DIMENSIONS 267 mm X 140 mm X 73 mm  
(10<sup>1</sup>/<sub>2</sub>" L X 5<sup>1</sup>/<sub>2</sub>" H X 2<sup>7</sup>/<sub>8</sub>" W)

GENERAL DESCRIPTION

HOUSING: COMPACT FIRE-RETARDANT THERMOPLASTIC

MOUNTING: LIGHTING HEADS MOUNTED TOP OR SIDE, WALL-MOUNTED UNIT.

ELECTRICAL: 120 OR 277 VOLT PRIMARY, 6 OR 12 VOLT SECONDARY

FINISH: OFF WHITE

EMERGENCY LIGHTING BATTERY UNIT

CORPS OF ENGINEERS

DEPARTMENT OF THE ARMY

TYPE: XI2

FEATURES

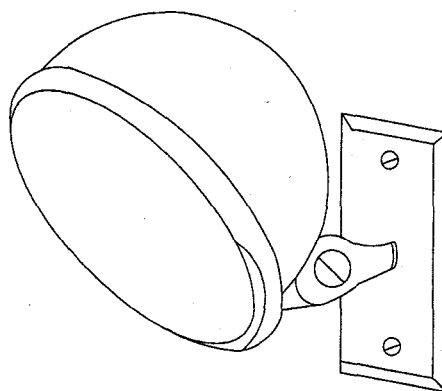
LAMP TYPE: 18W PAR36

PROFILE: 1 LAMP

OPTIONS

LAMP TYPE: 8W, 12W PAR36

PROFILE: 2 LAMP



NOM. DIMENSIONS 76 mm X 197 mm X 168 mm  
(3" D X 7<sup>3</sup>/<sub>4</sub>" H X 6<sup>5</sup>/<sub>8</sub>" W)

SPECIFICATIONS

HOUSING: IMPACT RESISTANT, FLAME RETARDANT THERMOPLASTIC

MOUNTING: TOP MOUNTING OR SIDE MOUNTING TO XI1 EMERGENCY UNIT

ELECTRICAL: 6 OR 12 VOLT SUPPLY FROM EMERGENCY UNIT

FINISH: OFF WHITE

EMERGENCY REMOTE-MOUNTED FLOODLIGHT  
FOR USE WITH TYPE XI1 EMERGENCY  
UNIT



CORPS OF ENGINEERS

DEPARTMENT OF THE ARMY

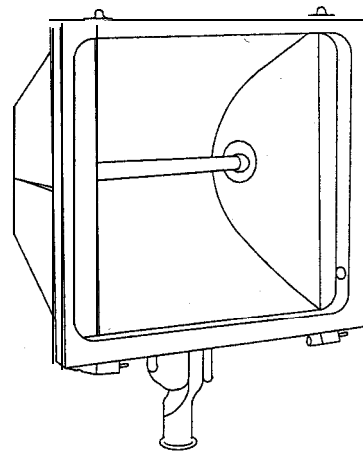
TYPE: EI2

FEATURES

LAMP TYPE: 500W T3 HALOGEN

PROFILE: 1 LAMP

SHIELDING: CLEAR TEMPERED GLASS



OPTIONS

LAMP TYPE: 300W, 425W, 1500W T3

NOM. DIMENSIONS 241 mm L X 197 mm H X 98 mm  
(9 $\frac{1}{2}$ " L X 7 $\frac{3}{4}$ " H X 3 $\frac{7}{8}$ " W)

GENERAL DESCRIPTION

HOUSING: CAST ALUMINUM

REFLECTORS: SPECULAR ALUMINUM

ELECTRICAL: 120 VOLT

FINISH: PAINTED DARK BRONZE FINISH

TUNGSTEN HALOGEN FLOODLIGHT

CORPS OF ENGINEERS

DEPARTMENT OF THE ARMY

TYPE: SF11

FEATURES

LAMP TYPE: F18DTT/RS

PROFILE: 1 LAMP

SHIELDING: CLEAR GLASS GLOBE

BALLAST: ELECTRONIC

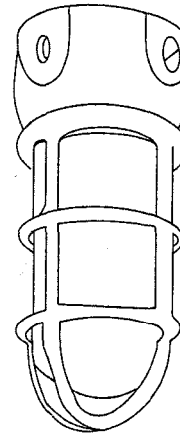
OPTIONS

LAMP TYPE: 90W TB/IF

MOUNTING: PENDANT, ARM MOUNT  
ADAPTER

SHIELDING: HEAT RESISTANT

BALLAST: HIGH POWER FACTOR  
MAGNETIC



NOM. DIMENSIONS 111 mm X 251 mm  
(4<sup>3</sup>/<sub>8</sub>" DIA. X 9<sup>7</sup>/<sub>8</sub>" H)

GENERAL DESCRIPTION

HOUSING: 30 PERCENT GLASS-FILLED THERMOPLASTIC POLYESTER

ELECTRICAL: 120 OR 277 VOLT BALLAST

FINISH: MOLDED IN NON-GRAYING FINISH

SURFACE MOUNTED COMPACT FLUORESCENT  
VAPOR TIGHT JELLY JAR WITH WIRE  
GUARD

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16528

EXTERIOR LIGHTING

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 SYSTEM DESCRIPTION
  - 1.3.1 Lighting System
  - 1.3.2 Design Requirements for Lighting
  - 1.3.3 Electrical Requirements
  - 1.3.4 Interface Between Lighting System and Power Distribution
  - 1.3.5 Nameplates
  - 1.3.6 Standard Products
  - 1.3.7 Unusual Service Conditions
- 1.4 CORROSION PROTECTION
  - 1.4.1 Aluminum Materials
  - 1.4.2 Ferrous Metal Materials
    - 1.4.2.1 Hardware
    - 1.4.2.2 Equipment
  - 1.4.3 Finishing

PART 2 PRODUCTS

- 2.1 STANDARD PRODUCT
- 2.2 BANNER ARMS
  - 2.2.1 On Aluminum, Steel, Fiberglass, and Concrete Poles
- 2.3 CABLE
  - 2.3.1 Insulated Cable
  - 2.3.2 Bare Copper Conductors
- 2.4 CABLE SPLICES AND CONNECTORS
  - 2.4.1 Twist-On Sealed Waterproof Connectors
  - 2.4.2 Low Voltage Waterproof Mechanical Connector Kit
- 2.5 CONDUIT, DUCTS AND FITTINGS
  - 2.5.1 Conduit, Rigid Steel
  - 2.5.2 Conduit Coatings
  - 2.5.3 Conduit Fittings and Outlets
    - 2.5.3.1 Boxes, Metallic Outlets
    - 2.5.3.2 Boxes, Nonmetallic, Outlet and Flush-Device Boxes and Covers
    - 2.5.3.3 Boxes, Switch (Enclosed), Surface Mounted
    - 2.5.3.4 Fittings for Conduit and Outlet Boxes
    - 2.5.3.5 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing
  - 2.5.4 Non-Metallic Duct
- 2.6 GROUND RODS
- 2.7 POLES
  - 2.7.1 Decorative Street Light Pole for Single Decorative Luminaires
  - 2.7.2 Decorative Street Light Pole for Single Residential Area Luminaire
  - 2.7.3 Parking Lot Street Light Pole for Single Shoebox Luminaire

## Grand Forks Phase 2 Levees

- 2.7.4 Steel Poles
- 2.7.5 Anchor Bolts
- 2.8 POLE LINE HARDWARE
- 2.9 ELECTRICAL ENCLOSURES
  - 2.9.1 Interior Enclosures
  - 2.9.2 Exposed-to-Weather Enclosures
  - 2.9.3 Corrosion Resistant Enclosures
  - 2.9.4 Street Light Control Center
    - 2.9.4.1 Cabinet Enclosure
    - 2.9.4.2 Circuit Breakers
    - 2.9.4.3 Lighting Contactors
    - 2.9.4.4 Test Switches
    - 2.9.4.5 Terminal Blocks
    - 2.9.4.6 Electronic Time Switches
    - 2.9.4.7 Photocell Controls
    - 2.9.4.8 Electrical Equipment and Wiring
- 2.10 ILLUMINATION
  - 2.10.1 General Lighting
    - 2.10.1.1 Downtown Single Decorative Street Light Luminaire
    - 2.10.1.2 Single Residential Area Street Light Luminaire
    - 2.10.1.3 Single Parking Lot Street Light Luminaire
- 2.11 LAMPS AND BALLASTS, HIGH INTENSITY DISCHARGE (HID) SOURCES
  - 2.11.1 High-Pressure Sodium
  - 2.11.2 Mercury Vapor
  - 2.11.3 Metal-Halide
- 2.12 LAMPS, FLUORESCENT
- 2.13 LUMINAIRE COMPONENTS
- 2.14 LIGHTING CONTROL EQUIPMENT
  - 2.14.1 Photo-Control Devices
  - 2.14.2 Timer Control Switches
  - 2.14.3 Safety Switches
  - 2.14.4 Magnetic Contactor
- 2.15 PHOTOMETRIC DISTRIBUTION CLASSIFICATION
- 2.16 LUMINAIRES, FLOODLIGHTING
  - 2.16.1 HID and Incandescent
  - 2.16.2 Fluorescent
- 2.17 FIXTURES
  - 2.17.1 Accessories
  - 2.17.2 Special Fixtures
  - 2.17.3 In-Line Fuse

## PART 3 EXECUTION

- 3.1 GENERAL
  - 3.1.1 Current Site Conditions
  - 3.1.2 Existing Equipment
- 3.2 ENCLOSURE PENETRATIONS
- 3.3 PREVENTION OF CORROSION
  - 3.3.1 Aluminum
  - 3.3.2 Steel Conduits
  - 3.3.3 Cold Galvanizing
- 3.4 CABLE INSTALLATION
  - 3.4.1 Splices
  - 3.4.2 Direct Burial
    - 3.4.2.1 Trenching
    - 3.4.2.2 Boring
    - 3.4.2.3 Requirements for Installation in Duct
    - 3.4.2.4 Location of Cable Splices
    - 3.4.2.5 Warning Tape

- 3.5 CONNECTIONS TO BUILDINGS
- 3.6 DUCT LINES
  - 3.6.1 Requirements
  - 3.6.2 Treatment
  - 3.6.3 Nonencased Direct-Burial
  - 3.6.4 Installation of Couplings
    - 3.6.4.1 Plastic Duct
  - 3.6.5 Concrete
  - 3.6.6 Duct Line Markers
- 3.7 HANDHOLES
  - 3.7.1 Construction
  - 3.7.2 Appurtenances
  - 3.7.3 Ground Rods
- 3.8 POLE INSTALLATION
  - 3.8.1 Pole Brackets
  - 3.8.2 Concrete Foundations
  - 3.8.3 Rigid Conduit Ells
  - 3.8.4 Aluminum and Steel Pole Installation
    - 3.8.4.1 Cast-In-Place Foundations
- 3.9 LIGHTING
  - 3.9.1 Lamps
  - 3.9.2 Fixture Installation
    - 3.9.2.1 Accessories
    - 3.9.2.2 In-Line Fuses
    - 3.9.2.3 Special Fixtures
- 3.10 LIGHTING CONTROL SYSTEM
  - 3.10.1 Photo-Control
  - 3.10.2 Time Control Switches
  - 3.10.3 Magnetic Contactors
- 3.11 GROUNDING
  - 3.11.1 Ground Rods
  - 3.11.2 Items to be Grounded
  - 3.11.3 Lighting Pole
- 3.12 TESTS
  - 3.12.1 Operating Test
  - 3.12.2 Ground Resistance Measurements

-- End of Section Table of Contents --

SECTION 16528

EXTERIOR LIGHTING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO LTS-3 (1994) Standard Specifications for  
Structural Supports for Highway Signs,  
Luminaires and Traffic Signals

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C78.1 (1991; C78.1a; R 1996) Fluorescent Lamps -  
Rapid-Start Types - Dimensional and  
Electrical Characteristics

ANSI C78.40 (1992) Mercury Lamps

ANSI C78.1350 (1990) 400-Watt, 100-Volt, S51  
Single-Ended High-Pressure Sodium Lamps

ANSI C78.1351 (1989) 250-Watt, 100-Volt S50 Single-Ended  
High-Pressure Sodium Lamps

ANSI C78.1352 (1990) 1000-Watt, 250-Volt, S52  
Single-Ended High-Pressure Sodium Lamps

ANSI C78.1355 (1989) 150-Watt, 55-Volt S55 High-Pressure  
Sodium Lamps

ANSI C78.1375 (1996) 400-Watt, M59 Single-Ended  
Metal-Halide Lamps

ANSI C78.1376 (1996) 1000-Watt, M47 Single-Ended  
Metal-Halide Lamps

ANSI C80.1 (1995) Rigid Steel Conduit - Zinc Coated

ANSI C82.4 (1992) Ballasts for  
High-Intensity-Discharge and Low-Pressure  
Sodium Lamps (Multiple-Supply Type)

ANSI C119.1 (1986; R 1997) Sealed Insulated  
Underground Connector Systems Rated 600  
Volts

## Grand Forks Phase 2 Levees

|              |  |
|--------------|--|
| ANSI C135.1  | (1979) Galvanized Steel Bolts and Nuts for Overhead Line Construction  |
| ANSI C135.14 | (1979) Staples with Rolled or Slash Points for Overhead Line Construction  |
| ANSI C136.2  | (1996) Luminaires, Voltage Classification Roadway Lighting Equipment   |
| ANSI C136.3  | (1995) Roadway Lighting Equipment-Luminaire Attachments  |
| ANSI C136.6  | (1997) Roadway Lighting Equipment - Metal Heads and Reflector Assemblies - Mechanical and Optical Interchangeability                       |
| ANSI C136.9  | (1990) Roadway Lighting - Socket Support Assemblies for Use in Metal Heads - Mechanical Interchangeability                                 |
| ANSI C136.10 | (1996) Roadway Lighting- Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing |
| ANSI C136.11 | (1995) Multiple Sockets for Roadway Lighting Equipment   |
| ANSI C136.15 | (1986) Roadway Lighting, High-Intensity-Discharge and Low-Pressure Sodium Lamps in Luminaires -  |

### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|                   |  |
|-------------------|--|
| ASTM A 123/A 123M | (2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products                 |
| ASTM A 153/A 153M | (1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware                             |
| ASTM A 575        | (1996) Steel Bars, Carbon, Merchant Quality, M-Grades                                |
| ASTM A 576        | (1990b; R 1995) Steel Bars, Carbon, Hot-Wrought, Special Quality                     |
| ASTM B 2          | (1994) Medium-Hard-Drawn Copper Wire   |
| ASTM B 8          | (1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft         |
| ASTM B 117        | (1997) Operating Salt Spray (Fog) Apparatus  |
| ASTM D 1654       | (1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments |

### ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

|  |   |
|--|---|
| IESNA RP-8   | (1983; R 1993) Roadway Lighting   |
| INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) |   |
| IEEE C2  | (1997) National Electrical Safety Code  |
| IEEE C136.13   | (1987; R 1997) Metal Brackets for Wood Poles  |
| IEEE Std 81  | (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)              |
| NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)     |   |
| NEMA 250   | (1997) Enclosures for Electrical Equipment (1000 Volts Maximum)   |
| NEMA ICS 1   | (1993) Industrial Control and Systems   |
| NEMA ICS 2   | (1993) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC |
| NEMA ICS 6   | (1993) Industrial Control and Systems, Enclosures   |
| NEMA OS 1  | (1996) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports   |
| NEMA OS 2  | (1986; Errata Aug 1986; R 1991) Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports                                       |
| NEMA RN 1  | (1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit                       |
| NEMA TC 6  | (1990) PVC and ABS Plastic Utilities Duct for Underground Installation  |
| NEMA TC 9  | (1990) Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation   |
| NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)              |   |
| NFPA 70  | (1999) National Electrical Code   |
| UNDERWRITERS LABORATORIES (UL)                           |   |
| UL 6   | (1997) Rigid Metal Conduit  |
| UL 44  | (1997; Rev Mar 1999) Rubber-Insulated Wires and Cables  |
| UL 50  | (1995; Rev thru Nov 1999) Enclosures for Electrical Equipment   |



|         |   |
|---------|---|
| UL 83   | (1998; Rev thru Sep 99)<br>Thermoplastic-Insulated Wires and Cables                               |
| UL 98   | (1994; Rev thru Jun 1998) Enclosed and<br>Dead-Front Switches                                     |
| UL 467  | (1993; Rev thru Apr 1999) Grounding and<br>Bonding Equipment                                      |
| UL 486A | (1997; Rev thru Dec 1998) Wire Connectors<br>and Soldering Lugs for Use with Copper<br>Conductors |
| UL 486B | (1997; Rev Jun 1997) Wire Connectors for<br>Use with Aluminum Conductors                          |
| UL 493  | (1995) Thermoplastic-Insulated Underground<br>Feeder and Branch-Circuit Cables                    |
| UL 514A | (1996; Rev Dec 1999) Metallic Outlet Boxes  |
| UL 514B | (1997; Rev Oct 1998) Fittings for Cable<br>and Conduit  |
| UL 514C | (1996; R Sep 1998) Nonmetallic Outlet<br>Boxes, Flush-Device Boxes, and Covers                    |
| UL 651  | (1995; Rev thru Oct 1998) Schedule 40 and<br>80 Rigid PVC Conduit                                 |
| UL 651A | (1995; Rev thru Apr 1998) Type EB and A<br>Rigid PVC Conduit and HDPE Conduit                     |
| UL 854  | (1996; Rev Apr 1998) Service-Entrance<br>Cables   |
| UL 1029 | (1994; Rev thru Dec 1997)<br>High-Intensity-Discharge Lamp Ballasts                               |
| UL 1571 | (1995; Rev thru Jun 1997) Incandescent<br>Lighting Fixtures                                       |
| UL 1572 | (1995; Rev thru Jun 1997) High Intensity<br>Discharge Lighting Fixtures                           |

## 1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be in accordance with Section 01330 SUBMITTAL PROCEDURES:

### SD-01 Data

#### Equipment and Materials; FIO

Data published by the manufacturer of each item on the list of equipment and material, to permit verification that the item proposed is of the correct size, properly rated or applied, or is

otherwise suitable for the application and fully conforms to the requirements specified.

#### SD-04 Drawings

Lighting System; GA  
Detail Drawings; GA

Detail drawings for the complete system and for poles, lighting fixtures, banner arms, handholes, controllers, and streetlight control center.

As-Built Drawings; FIO

Final as-built drawings shall be finished drawings on mylar or vellum and shall be delivered with the final test report.

#### SD-09 Reports

Operating Test; GA

Test procedures and reports for the Operating Test. After receipt by the Contractor of written approval of the test procedures, the Contractor shall schedule the tests. The final test procedures report shall be delivered after completion of the tests.

Ground Resistance Measurements; FIO

The measured resistance to ground of each separate grounding installation, indicating the location of the rods, the resistance of the soil in ohms per millimeter and the soil conditions at the time the measurements were made. The information shall be in writing.

#### SD-19 Operation and Maintenance Manuals

Lighting System; FIO

A draft copy of the operation and maintenance manuals, prior to beginning the tests for use during site testing. Final copies of the manuals as specified bound in hardback, loose-leaf binders, within 30 days after completing the field test. The draft copy used during site testing shall be updated with any changes required, prior to final delivery of the manuals. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and nearest service representatives for each item of equipment for each system. The manuals shall have a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies delivered after completion of the field test shall include modifications made during installation checkout and acceptance.

### 1.3 SYSTEM DESCRIPTION

#### 1.3.1 Lighting System

The lighting system shall be configured as specified and shown. The system shall include all fixtures, hardware, poles, cables, connectors, adapters and appurtenances needed to provide a fully functional lighting system.

#### 1.3.2 Design Requirements for Lighting

The lighting system shall be configured as specified and shown. Equipment shall conform to NFPA 70 and IEEE C2. The lighting configuration shall provide sufficient light for each area. The system shall include all fixtures, hardware, poles, cables, connectors, adapters, and appurtenances needed to provide a fully functional lighting system.

#### 1.3.3 Electrical Requirements

The equipment shall operate from a voltage source as shown, plus or minus 10 percent, and 60 Hz, plus or minus 2 percent.

#### 1.3.4 Interface Between Lighting System and Power Distribution

Conductors shall be as indicated.

#### 1.3.5 Nameplates

Each major component of equipment shall have a nonferrous metal or engraved plastic nameplate which shall show, as a minimum, the manufacturer's name and address, the catalog or style number, the electrical rating in volts, and the capacity in amperes or watts.

#### 1.3.6 Standard Products

Materials and equipment shall be standard products of manufacturer regularly engaged in the manufacture of such products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

#### 1.3.7 Unusual Service Conditions

Equipment and materials furnished under this section shall be suitable for the following unusual service conditions: ambient temperature -40 degrees F.

### 1.4 CORROSION PROTECTION

#### 1.4.1 Aluminum Materials

Aluminum shall not be used in contact with earth or concrete. Where aluminum conductors are connected to dissimilar metal, fittings conforming to UL 486B shall be used.

#### 1.4.2 Ferrous Metal Materials

##### 1.4.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153/A 153M and ASTM A 123/A 123M.

##### 1.4.2.2 Equipment

Equipment and component items, including but not limited to metal poles and ferrous metal luminaires not hot-dip galvanized or porcelain enamel finished, shall be provided with corrosion-resistant finishes which shall withstand 480 hours of exposure to the salt spray test specified in ASTM B 117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1/16 inch from the test mark. The scribed test mark and test evaluation shall have a rating of not less than 7 in accordance with TABLE 1, (procedure A) of ASTM D 1654. Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with a zinc rich paint conforming to the manufacturer's standard.

#### 1.4.3 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory, shall be as specified in Section 09900 PAINTING, GENERAL.

### PART 2 PRODUCTS

#### 2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

#### 2.2 BANNER ARMS

##### 2.2.1 On Aluminum, Steel, Fiberglass, and Concrete Poles

Poles shall be provided with banner arms of the style and of the length indicated on drawings. Banner arms shall conform to the design of the pole provided. The banner arms shall be capable of supporting the equipment to be mounted on it with the maximum wind and ice loading encountered at the site. Strength of banner arms shall be in accordance with IEEE C136.13. Steel banner arms shall be galvanized. Wood banner arms shall not be used.

#### 2.3 CABLE

The Contractor shall provide all wire and cable not indicated as government furnished equipment. Wire and cable components shall be able to withstand the jobsite environment for a minimum of 20 years.

##### 2.3.1 Insulated Cable

Cable shall be type USE conforming to UL 854, with copper conductors and type RHW or XHHW insulation conforming to UL 44, and shall include green ground conductor. Cable shall be Type UF-B conforming to UL 83 and UL 493, with copper conductors. Cable shall be provided with insulation of a thickness not less than that given in column A B of TABLE 15.1 of UL 854. Cable shall be rated 600 volts. Parts of the cable system such as splices and terminations shall be rated not less than 600 volts. The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded.

##### 2.3.2 Bare Copper Conductors

Medium-hard-drawn copper conductors shall conform to ASTM B 2 and ASTM B 8.

## 2.4 CABLE SPLICES AND CONNECTORS

Cable splices and connectors shall conform to UL 486A. Underground splices and connectors shall also conform to the requirements of ANSI C119.1.

### 2.4.1 Twist-On Sealed Waterproof Connectors

Provide twist-on sealed waterproof connectors where indicated on the drawing schedule. Connectors shall meet NEC Article 100-11 for use in all NEMA enclosures and shall be UL 50 tested and raintight/watertight. Connectors shall come prefilled with custom sealant which shall act to lock out moisture and air. Connectors shall have an infinite shelf life and include color coding to indicate acceptable wire sizes. Connectors shall have a voltage rating of 600 volts ac, a temperature rating of 221 degrees F, a sealant temperature rating range of -45 degrees F to 400 degrees F, and suitable for copper-to-copper wire combinations. Connectors shall be taped with electrical tape.

### 2.4.2 Low Voltage Waterproof Mechanical Connector Kit

Provide mechanical bolted connectors where indicated on the drawing schedule. Connectors shall be comprised of a connector and an outer closure, prefilled with a waterproofing gel material. Connectors shall accept up to 4 properly sized conductors per connector. Connectors shall be rated for 600 volts ac and suitable for copper-to-copper and copper-to-aluminum conductor combinations. Outer hinged closure shall contain a prefilled waterproofing gel and 2 locking snaps to secure closure when fully closed.

## 2.5 CONDUIT, DUCTS AND FITTINGS

### 2.5.1 Conduit, Rigid Steel

Rigid steel conduit shall conform to ANSI C80.1 and UL 6.

### 2.5.2 Conduit Coatings

Underground metallic conduit and fittings shall be coated with a plastic resin system conforming to NEMA RN 1, Type 40. Epoxy systems may also be used.

### 2.5.3 Conduit Fittings and Outlets

#### 2.5.3.1 Boxes, Metallic Outlets

NEMA OS 1 and UL 514A.

#### 2.5.3.2 Boxes, Nonmetallic, Outlet and Flush-Device Boxes and Covers

NEMA OS 2 and UL 514C.

#### 2.5.3.3 Boxes, Switch (Enclosed), Surface Mounted

UL 98.

#### 2.5.3.4 Fittings for Conduit and Outlet Boxes

UL 514B.

#### 2.5.3.5 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing

UL 514B.

#### 2.5.4 Non-Metallic Duct

Non-metallic duct lines and fittings utilized for underground installation shall be suitable for the application. Duct shall be thick-wall, single, round-bore type. Material of one type shall be used. Acrylonitrile-butadiene-styrene (ABS) duct shall conform to NEMA TC 6 and NEMA TC 9. High-density conduit shall conform to UL 651A. Schedule 40 polyvinyl chloride (PVC) shall conform to UL 651. Plastic utility duct and fittings manufactured without a UL label or listing shall be provided with a certification as follows: "The materials are suitable for use with 167 degree F wiring. No reduction of properties in excess of that specified for materials with a UL label or listing will be experienced if samples of the finished product are operated continuously under the normal conditions that produce the highest temperature in the duct."

#### 2.6 GROUND RODS

Ground rods shall be of copper clad steel conforming to UL 467 not less than 5/8 inch in diameter by 8 feet in length of the sectional type driven full length into earth.

#### 2.7 POLES

Metal and concrete poles shall be the pole manufacturer's standard design for supporting the number of fixtures indicated. Poles shall be designed for a wind velocity of 80 mph at the base of the pole, for a wind gust factor of 1.3, and for the height and drag factors recommended by AASHTO LTS-3. The effective projected area of luminaires and other pole-mounted devices shall be taken into account in pole design. Poles shall have grounding provisions. The type of pole shaft material provided shall not be mixed on any project. Grounding connection shall be provided near the bottom of each metal pole and at each concrete pole anchor base. Scratched, stained, chipped, or dented poles shall not be installed.

##### 2.7.1 Decorative Street Light Pole for Single Decorative Luminaires

The lighting pole shall consist of a decorative fluted base, a 5 inch diameter fluted shaft with a tenon for luminaire mounting. Accessories include a duplex GFCI receptacle with weatherproof cover for festoon lighting and 2 banner arms with breakaway couplings designed to fail at 85 mph wind speeds. The pole base material shall be heavy-wall cast aluminum (356.1 alloy) formed true to pattern. The shaft material shall be fluted aluminum extrusion (6061-T6). Banner arms shall be aluminum pipe construction. All hardware shall be tamper resistant, stainless steel. The post shall be 16 feet in height with a 44 inch tall x 16 inch diameter base. The fluted shaft shall have a 5 inch outside diameter and a 0.228 inch nominal wall thickness, with a 3 inch diameter x 2-5/8 inch tall tenon for luminaire mounting. Banner arms shall be 1 inch pipe (1-5/16 inch diameter) and measure 24 inches in length. Poles shall be provided with four 3/4 inch diameter x 24 inch L-type anchor bolts. A door shall be located in the base for anchorage and wiring access. A grounding screw shall be provided inside the base, opposite the door, for easy access. The pole shall be finish with a black powder coat finish. The pole shall match

existing downtown street light poles for make and model.

Existing downtown street light pole is Holophane Charleson Series Cast Aluminum, Catalog #CH16F5/16-CA/BK-RS/GFI/WPC-BBA242/1/BO/CA/BK-NP28-CA/BK. Contact Holophane Representative, John Wethern, Holophane 3403 South 12th Street, Moorhead, MN 56560, Telephone 218-291-9499 to confirm catalog # of existing pole.

#### 2.7.2 Decorative Street Light Pole for Single Residential Area Luminaire

The lighting pole shall consist of a decorative fluted base, a 5 inch diameter fluted shaft with a tenon for luminaire mounting. The pole base material shall be heavy-wall cast aluminum (356.1 alloy) formed true to pattern. The shaft material shall be fluted aluminum extrusion (6061-T6). All hardware shall be tamper resistant, stainless steel. The post shall be 14 feet in height with a 44 inch tall x 16 inch diameter base. The fluted shaft shall have a 5 inch outside diameter and a 0.228 inch nominal wall thickness, with a 3 inch diameter x 2-5/8 inch tall tenon for luminaire mounting. Poles shall be provided with four 3/4 inch diameter x 24 inch L-type anchor bolts. A door shall be located in the base for anchorage and wiring access. A grounding screw shall be provided inside the base, opposite the door, for easy access. The pole shall be finish with a black powder coat finish. The pole shall match existing downtown street light poles for make and model with the exception they shall have no banner arms or festoon outlet receptacle.

Existing downtown street light pole without banner arms and gestoon outlet receptacle is Holophane Charleson Series Cast Aluminum, Catalog #CH14F5/16-CA/BK. Contact Holophane Representative, John Wethern, Holophane 3403 South 12th Street, Moorhead, MN 56560, Telephone 218-291-9499 to confirm catalog # of existing pole without banner arms and festoon outlet receptacle.

#### 2.7.3 Parking Lot Street Light Pole for Single Shoebox Luminaire

The lighting pole shall consist of a square steel straight tubing 30 feet in height rated for 80 MPH wind with a 1.3 time gust factor. The pole shall have a handhole type access cover located 1 foot above the base. The base shall be 12.63 inches square with an 11.5 inch bolt circle. The pole shall be provided with four 1 inch diameter x 36 inches L-type anchor bolts to meet manufacturers loading requirements. A grounding screw shall be provided inside the base. A 2-piece plastic base cover shall be provided to shield the anchor bolts and base plate. The pole shall be finish with a black powder coat finish. The pole shall have no festoon outlet receptacle.

#### 2.7.4 Steel Poles

Steel poles shall be hot-dip galvanized in accordance with ASTM A 123/A 123M and shall not be painted. Poles shall have tapered tubular members, either round in cross-section or polygonal. Pole shafts shall be one piece. Poles shall be welded construction with no bolts, rivets, or other means of fastening except as specifically approved. Pole markings shall be approximately 3 to 4 feet above grade and shall include manufacturer, year of manufacture, top and bottom diameters, length, and a loading tree. Attachment requirements shall be provided as indicated, including grounding provisions. Climbing facilities are not required. Bases shall be of the anchor bolt-mounted type.

#### 2.7.5 Anchor Bolts

Anchor bolts shall be the pole manufacturer's standard, but not less than necessary to meet the pole wind and ice loading, herein and other specified design requirements.

## 2.8 POLE LINE HARDWARE

Zinc coated hardware shall conform to ANSI C135.1 and ANSI C135.14, and steel hardware material shall conform to ASTM A 575 and ASTM A 576. Hardware shall be hot-dip galvanized in accordance with ASTM A 153/A 153M.

## 2.9 ELECTRICAL ENCLOSURES

The Contractor shall provide metallic enclosures as needed to house the lighting equipment. Enclosures shall conform to NEMA ICS 6 and NEMA 250. Enclosures shall be provided with lockable or padlock handles. Keys for lockable enclosures shall be delivered to the Contracting Officer. The enclosures shall be as specified or as shown on the drawings.

### 2.9.1 Interior Enclosures

Enclosures to house lighting equipment in an interior environment shall meet the requirements of a NEMA 12 enclosure as defined in NEMA 250.

### 2.9.2 Exposed-to-Weather Enclosures

Enclosures to house lighting equipment in an outdoor environment shall meet the requirements of a NEMA 4 enclosure as defined in NEMA 250.

### 2.9.3 Corrosion Resistant Enclosures

Enclosures to house lighting equipment in a corrosive environment shall meet the requirements of a NEMA 4X enclosure as defined in NEMA 250.

### 2.9.4 Street Light Control Center

Provide lighting service cabinet(s) for the purpose of distributing electrical power, providing overcurrent protection and providing a means to disconnect and control power to all or part of lighting system.

#### 2.9.4.1 Cabinet Enclosure

Lighting service cabinet enclosure shall be constructed of a minimum of 3/32 inch thick steel and shall be deadfront type with a hinged door for access to the contactor(s). The cabinet shall have a weathertight door capable of being securely latched at 3 points and released by an easy turning handle. The handle and three point locking mechanism shall lock with a standard Owner-furnished padlock. Hinges shall be fabricated from stainless steel. Hinges may be welded on or fastened with stainless steel tamperproof bolts.

All surfaces of the cabinet shall be thoroughly cleaned and painted with at least one coat of rust resistant primer and two coats of high grade oil resistant enamel. Cabinet exterior finish color shall be industrial green and interior finish color shall be gloss white including interior deadfront hinged panel.

#### 2.9.4.2 Circuit Breakers

Circuit breakers shall be thermo-magnetic type. Main circuit breakers shall



be located on the line side of the lighting contactor(s). The lighting contactor(s) shall be located on the line side of the branch circuit breakers. Each branch circuit breaker shall be bolted onto a copper bus and shall be labeled indicating the lighting load(s) that it serves. Labels shall be pressure sensitive vinyl embossed label-maker tape 3/8 inch high with 5/32 inch high letters. Spacers shall cover empty circuit breaker spaces for circuits that are not used.

#### 2.9.4.3 Lighting Contactors

Lighting contactor(s) shall be the amperage rating and number of poles as required, normally open, electrically held, open type, and shall be rated for tungsten filament and ballast lighting loads. The control coil shall be actuated by photocell or timeclock or both and shall be protected by a properly sized circuit breaker on the line side of the photocell/timeclock and test switch.

#### 2.9.4.4 Test Switches

Test switch(es) shall be a heavy duty, 2-position, rotary switch. One switch position shall be labeled "AUTOMATIC" and the other switch position shall be labeled "TEST". In the "AUTOMATIC" position, the test switch(es) shall connect the coil of the lighting contactor to the AC+ (switched) from the photocell or timeclock control, providing control of the lighting circuit. In the "TEST" position, the test switch(es) shall connect the coil of the lighting contactor to the AC+ (unswitched) from the photocell or timeclock control, providing power to the circuit regardless of the state of the lighting control(s).

#### 2.9.4.5 Terminal Blocks

Provide terminal blocks in cabinets for termination and connection of power and control wiring. Terminal blocks shall be strap screw type rated 600 volts and have white marking strips.

#### 2.9.4.6 Electronic Time Switches

Provide 24-hour programmable electronic time switch(es) where indicated on the drawings. Time switch(es) shall include a 1/4 inch high LCD display which shall show the current time of day with A.M. or P.M. indication and "ON" or "OFF" during programming or the current status of the load control contacts in the automatic mode. Switch(es) shall include a minimum of 8 points or events (4 "ON" / 4 "OFF") which can be preset to automatically repeat on a daily basis. It shall be possible to override the programming at any time by placing a selector switch into a manual position.

Switch(es) shall be equipped with large teeter type terminal screws and saddle clamps to securely fasten a range of No. 18 AWG to No. 10 AWG wire for both input power and output switching.

Switch(es) shall be furnished with a SPST contact configuration and shall be sized for loads up to 30 amps at 120 or 240 volts ac. Clock voltage shall be 120 VAC, 60 Hertz. Maximum switch power consumption shall be approximately 3 watts.

Switch(es) shall be furnished with factory-installed industrial-grade standard alkaline batteries to provide automatic carryover for a minimum of 3 years.

Switch(es) shall be housed in a grey finished lockable steel enclosure to protect components from vandalism and unauthorized tampering. Switch shall be capable of operating in a temperature range of -40 degrees F to 122 degrees F and a humidity range of 0 percent to 95 percent noncondensing.

#### 2.9.4.7 Photocell Controls

Photocell control for control of exterior lighting circuits shall be fixed mounting thermal type unit with inherent delay action to prevent false switching due to momentary flashes of light. Control shall be weatherproof, mounted on stainless steel cover plate, and mounted on the side of the control cabinet. The photocell shall be rated at 1000 watts (tungsten), 120 volts ac.

#### 2.9.4.8 Electrical Equipment and Wiring

Lighting control cabinet(s) components shall be arranged and wired as indicated on the Drawings. The lighting control cabinet shall be a pad-mounted cabinet properly sized to accommodate the components required. The cabinet shall have provisions for being secured to a fiberglass ground sleeve by means of 4 properly sized bolts. The cabinet shall be provided with one 2-pole main circuit breaker (service entrance rated); with the number and size lighting contactors noted on the drawings; with the number and size single-pole branch circuit breakers for street lighting and festoon circuits noted on the drawings; one 15 ampere single-pole branch circuit breaker for the control circuit; 2 heavy-duty, 2-position rotary test switches; one 24-hour timeclock with adjustable settings, and 1 photocell control mounted in the side of the cabinet. Properly sized termination lugs shall be provided for 1 incoming single-phase 120/240 volts ac 3-wire circuit (No. 4/0 AWG Str. CU), the number and size of outgoing single-phase 120 volts ac 2-wire street light circuits (No. 2 AWG Str. CU) and outgoing single-phase 120 volts ac 2-wire festoon circuits (No. 2 AWG Str. CU) as noted on the drawings.

Light control cabinet shall be furnished with 31 inches wide x 19 inches long x 18 inches high, preformed fiberglass ground sleeve. Ground sleeve shall have an appropriately sized opening in the top to allow cable entrance to the cabinet. The specified ground sleeve width and length dimensions are to be considered minimums and the ground sleeve provided shall fit the design of the cabinet.

All cabinet neutral/ground bonding bars and bus bars shall be copper. All connectors shall be UL listed for copper conductors. All wiring inside the cabinet shall be of sufficient length to allow for contraction.

### 2.10 ILLUMINATION

#### 2.10.1 General Lighting

Luminaires, ballasts, lamps, and control devices required for general area, parking lot, and streetlighting, including floodlighting shall be in accordance with the drawings.

##### 2.10.1.1 Downtown Single Decorative Street Light Luminaire

Luminaire shall be one-piece, heat resistant, borosilicate glass prismatic refractor, acorn style with cast aluminum decorative finial, fluted cast aluminum tenon fitting, and double fixture with cast aluminum bracket style as shown on the drawings and shall match the existing luminaires in the

downtown area. Lamps shall be 150 watt HPS with mogul base. Ballast shall be HPF CWA Type, 120 volt. Fixture shall be Type III light distribution.

Existing downtown street light luminaires and crossarms are Holophane Granville Series luminaire fixture, Catalog #GVU15AHPXX-B3NFG. Contact Holophane Representative, John Wethern, Holophane 3403 South 12th Street, Moorhead, MN 56560, Telephone 218-291-9499 to confirm catalog # of existing fixtures and crossarms.

#### 2.10.1.2 Single Residential Area Street Light Luminaire

Luminaire shall be an 18 foot high Century English colonial lantern style. The optical assembly shall be enclosed by 4 tempered glass panels mechanically held to a cast aluminum window frame housing topped with a decorative gasketed cover, hinged and latched to the window frame housing. The optical assembly shall be a molded thermal resistant borosilicate glass refractor mechanically attached to the socket assembly. Light distribution shall be Type V. The ballast shall be a high power factor autotransformer type, 120 volt. Lamp shall be 150 Watt HPS. The cast aluminum fitter assembly shall be designed to mount on 3 inches high by 3 inches diameter tenon secured by 8 stainless steel allen head set screws. The fixture shall include decorative ladder rests. Luminaire shall be finished with a polyester powder paint in a black color.

#### 2.10.1.3 Single Parking Lot Street Light Luminaire

Luminaire shall be a rectangular shoe box style fixture measuring 15 inches x 21-1/2 inches x 8 inches. Lamp shall be 250 Watt HPS, 120 volt. Optical refractor shall be flat prismatic borosilicate glass. Luminaire shall be finished with a polyester powder paint in a black color. Luminaire shall be single close mount on a square pole.

### 2.11 LAMPS AND BALLASTS, HIGH INTENSITY DISCHARGE (HID) SOURCES

#### 2.11.1 High-Pressure Sodium

Lamps shall conform to ANSI C78.1350 or ANSI C78.1351 or ANSI C78.1352 or ANSI C78.1355. Ballasts shall conform to ANSI C82.4, or UL 1029. High-pressure sodium lamps shall be clear.

#### 2.11.2 Mercury Vapor

Lamps shall conform to ANSI C78.40. Ballasts shall conform to ANSI C82.4.

#### 2.11.3 Metal-Halide

Lamps shall be made by a manufacturer with not less than 5 years experience in making metal-halide lamps. Metal-halide lamps shall conform to ANSI C78.1375 or ANSI C78.1376. Ballasts shall conform to ANSI C82.4 or UL 1029.

### 2.12 LAMPS, FLUORESCENT

Fluorescent lamps shall have standard cool-white color characteristics and shall not require starter switches. The lamps shall be of the rapid-start type.

### 2.13 LUMINAIRE COMPONENTS

Luminaire components shall conform to the following: attachments, ANSI

C136.3; voltage classification, ANSI C136.2; field identification marking, ANSI C136.15; interchangeability, ANSI C136.6 and ANSI C136.9; and sockets, ANSI C136.11.

## 2.14 LIGHTING CONTROL EQUIPMENT

### 2.14.1 Photo-Control Devices

Photo-control devices shall conform to ANSI C136.10. Each photo-control element shall be a replaceable, weatherproof, plug-in or twist-lock assembly adjustable operation range of approximately 0.5 to 5.0 foot-candles. Luminaires shall be equipped with weatherproof plug-in or twist-lock receptacle to receive the photo-control element.

### 2.14.2 Timer Control Switches

Astronomic dial type arranged to turn "ON" at sunset, and turn "OFF" at a pre-determined time between 2030 hours and 2400 hours, automatically changing the settings each day in accordance with seasonal changes of sunset and sunrise shall be provided. A switch rated 240 volts, having automatically wound spring mechanism to maintain accurate time for a minimum of 7 hours following a power failure shall be provided. A time switch with a manual on-off bypass switch shall be provided. Housing for the time switch shall be a surface mounted, NEMA 1 (indoor) enclosure conforming to NEMA ICS 6.

### 2.14.3 Safety Switches

Switches shall be the heavy-duty type with NEMA ICS 6 Type 1 enclosures and shall be suitable for operation on a 240 volt, 60 Hz, single-phase system. Switch construction shall be such that a screwdriver will be required to open the switch door when the switch is on. Blades shall be visible with door open and shall be of the quick-make, quick-break type. Terminal lugs shall be coordinated with the wire size. Switches shall conform to UL 98.

### 2.14.4 Magnetic Contactor

Magnetic contactors shall be mechanically held, electrically operated, and shall conform to NEMA ICS 1 and NEMA ICS 2. The contactor shall be suitable for 240 volts, single-phase, 60 Hz. Coil voltage shall be 120 volts. Maximum continuous ampere rating and number of poles shall be as indicated on drawings. Enclosures for contactors mounted indoors shall be NEMA ICS 6, Type 1. Each contactor shall be provided with a spare, normally open auxiliary contact. Terminal lugs shall be coordinated with the wire size.

## 2.15 PHOTOMETRIC DISTRIBUTION CLASSIFICATION

Photometrics shall conform to IESNA RP-8.

## 2.16 LUMINAIRES, FLOODLIGHTING

### 2.16.1 HID and Incandescent

HID lighting fixtures shall conform to UL 1572. Incandescent lighting fixtures shall conform to UL 1571.

### 2.16.2 Fluorescent

Fluorescent lamps shall conform to ANSI C78.1.

## 2.17 FIXTURES

Standard fixtures shall be as detailed on drawings. Illustrations shown on these sheets or on the drawings are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar design, equivalent light distribution and brightness characteristics, equal finish and quality will be acceptable as approved. However, fixtures so noted to match existing must match exact make, model, and manufacturer in order to provide for interchangeable parts and materials for maintenance purposes, inventory control, and uniformity in application.

### 2.17.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

### 2.17.2 Special Fixtures

The types of special fixtures are designated by letters and numbers. For example, SP-1 denotes special Type 1.

### 2.17.3 In-Line Fuse

An in-line fuse shall be provided for each fixture, and shall consist of a fuse and a UL approved waterproof breakaway fuse holder rated at 30 amperes, 600 volts, with insulated boots. Fuse rating shall be 600 volts.

Fuseholders shall be single-pole, in-line, watertight breakaway type designed to be attached to solid or stranded copper or aluminum wire. Fuseholders shall accommodate 1-1/2 inches x 13/32 inch midget and Class CC fuses. Fuseholders shall incorporate a built-in breakaway feature which shall isolate the load should the connecting wire come under tension. Fuseholders shall use internal O-rings to provide a water-resistant compartment for the fuse. Fuseholders shall have a 600 volt ac; 30 ampere minimum rating, be UL-listed and meet National Electric Code requirements for branch circuit protection.

Provide fuses of the type, class, and rating as stated below for the type of lamp specified or indicated on the drawing schedule. Fuses shall be manufacturer's premium grade.

| Lamp Wattage | Fuse Size |
|--------------|-----------|
| 150          | 6 ampere  |
| 250          | 8 ampere  |
| 400          | 8 ampere  |

Provide 15 ampere fuses for all festoon circuit fuseholders.

Fuses for lighting loads shall be fast-acting, nondelay, current limiting type fuses sized as required for the fuseholders being supplied. Fuses shall be rated for 600 volts ac or less and shall have an interrupting rating of 100,000 amperes rms symmetrical.

## PART 3 EXECUTION

### 3.1 GENERAL

The Contractor shall install all system components, including government furnished equipment, and appurtenances in accordance with the manufacturer's instructions, IEEE C2, and contract documents, and shall furnish necessary hardware, fixtures, cables, wire, connectors, interconnections, services, and adjustments required for a complete and operable system.

#### 3.1.1 Current Site Conditions

The Contractor shall verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions that will affect performance of the system to the Government. The Contractor shall not take any corrective action without written permission from the Government.

#### 3.1.2 Existing Equipment

The Contractor shall connect to and utilize existing lighting equipment and devices as shown. Lighting equipment that is usable in their original configuration without modification may be reused with Government approval. The Contractor shall perform a field survey, including testing and inspection of existing lighting equipment and control lines intended to be incorporated into the lighting system, and furnish a report to the Government. For those items considered nonfunctioning, specification sheets, or written functional requirements to support the findings and the estimated cost to correct the deficiency shall be provided with the report.

As part of the report, the Contractor shall include the scheduled need date for connection to all existing equipment. The Contractor shall make written requests and obtain approval prior to disconnecting any control lines and equipment, and creating equipment downtime. Such work shall proceed only after receiving Government approval of these requests. If any device fails after the Contractor has commenced work on that device, the Contractor shall diagnose the failure and perform any necessary corrections to the equipment. The Government is responsible for maintenance and repair of Government equipment. The Contractor shall be held responsible for repair costs due to Contractor negligence or abuse of Government equipment.

### 3.2 ENCLOSURE PENETRATIONS

Enclosure penetrations shall be from the bottom unless the system design requires penetrations from other directions. Penetrations of interior enclosures involving transitions of conduit from interior to exterior, and penetrations on exterior enclosures shall be sealed with rubber silicone sealant to preclude the entry of water. The conduit riser shall terminate in a hot-dipped galvanized metal cable terminator. The terminator shall be filled with an approved sealant as recommended by the cable manufacturer, and in such a manner that the cable is not damaged.

### 3.3 PREVENTION OF CORROSION

#### 3.3.1 Aluminum

Aluminum shall not be used in contact with earth or concrete, and where connected to dissimilar metal, shall be protected by approved fittings and treatment.

#### 3.3.2 Steel Conduits

Steel conduits shall not be installed within concrete slabs-on-grade. Steel conduits installed underground or under slabs-on-grade, or penetrating slabs-on-grade, shall be field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlap, or shall have a factory-applied plastic resin, epoxy coating. Zinc coating may be omitted from steel conduit which has a factory-applied epoxy coating.

### 3.3.3 Cold Galvanizing

Field welds and/or brazing on factory galvanized boxes, enclosures, conduits, etc. shall be coated with a cold galvanized paint containing at least 95 percent zinc by weight.

## 3.4 CABLE INSTALLATION

Cable and all parts of the cable system such as splices and terminations shall be rated not less than 600 volts. The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded. Each circuit shall be identified by means of fiber or nonferrous metal tags, or approved equal, in each handhole, and at each terminal.

### 3.4.1 Splices

Splices below grade shall be made with nonpressure-filled resin systems using transparent, interlocking, self-venting, longitudinally split plastic molds. Splices above grade shall be made with sealed insulated pressure connectors and shall provide insulation and jacket equal to that of the cable. In order to prevent moisture from entering the splice, jackets shall be cut back to expose the required length of insulation between the jacket and the tapered end of the insulation.

### 3.4.2 Direct Burial

Minimum cover from top of cable to finished grade shall be 30 inches for direct buried cable.

#### 3.4.2.1 Trenching

Trenches shall be excavated to the depths required to provide the minimum cable cover. The bottom of the trench shall be smooth and free of stones and sharp objects. Where the bottom of the trench consists of material other than sand or earth, an additional 3 inch layer shall be removed and replaced by a 3 inch layer of sand or stone-free earth compacted to the approximate density of the surrounding firm soil. The cables shall be unreeled in place along the side of or in the trench and carefully placed on the sand or earth bottom. Pulling cables into a direct-burial trench from a fixed reel position will not be permitted. Where cables cross, a separation of at least 3 inches shall be provided, unless the cables are protected by nonmetallic conduit sleeves at the crossing. The radius of bends in cables shall be not less than 12 times the diameter of the cable. Cables shall not be left under longitudinal tension. The first layer of backfill shall be 6 inches thick and shall consist of sand or stone-free earth. A 5 mil, bright red colored plastic tape not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers, or other approved dig-in warning indication, shall be placed approximately 12 inches below finished grade levels of trenches. Selected backfill of sand or stone-free earth shall be provided to a minimum depth of 3 inches above

cables.

#### 3.4.2.2 Boring

All boring depths shall match connecting trench or plowing depths as measured from the finished grade to the top surface of the cable. The routing shall be as indicated on the drawings, unless conditions encountered are such that changes are necessary to accomplish the work. If obstructions or difficulties in boring are encountered, the Contractor shall determine the nature and extent of the difficulty and the Contracting Officer will determine if rerouting or other changes are necessary. Boring hole dimensions specified are minimum and may be increased as required to complete the work.

Where bores require conduit, the boring excavation shall not exceed the outside diameter of the pipe. Furnish and install conduit of the type and size as specified or as indicated on the drawings.

Boring pits shall be as required for the number of and dimensional size of the bore. Bore pits shall be braced and protected as necessary to provide for a safe working environment. Construction shall be arranged so that bore pits will be left open for the shortest practicable time to avoid creating a hazard to the public and to minimize the likelihood of collapse due to other construction activity, rain, accumulation of water in the pit, etc.

#### 3.4.2.3 Requirements for Installation in Duct

Where indicated on drawing, cable shall be installed in duct lines. Ground and neutral conductors shall be installed in duct with the associated phase conductors. The segments of direct-burial cable that cross under new railroad tracks, roads, or paving exceeding 5 feet in width, shall be installed in plastic, or rubber duct encased in concrete in accordance with paragraph DUCT LINES. Pulling of cable into conduit from a fixed reel position will be permitted. At interfaces with direct-burial cable, the direct-burial cable shall be centered in the entrance to the duct, using an approved waterproof, nonhardening mastic compound to facilitate the centering.

#### 3.4.2.4 Location of Cable Splices

Splices in direct-burial cable will not be permitted in runs of 500 feet or less or at intervals of less than 500 feet in longer runs except as required for taps. Where cable splices in shorter intervals are required to avoid obstructions or damage to the cable, the location shall be as approved. Cable splices shall be installed in cable boxes or concrete handholes.

#### 3.4.2.5 Warning Tape

Direct burial cable shall be placed below a plastic warning tape buried in the same trench or slot. A 5 mil bright red colored plastic tape, not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers with a continuous metallic backing and a corrosion-resistant 1 mil metallic foil core to permit easy location of the buried cable, shall be placed approximately 12 inches below finished grade.

### 3.5 CONNECTIONS TO BUILDINGS



Cables shall be extended into the various buildings as indicated and shall be properly connected to the indicated equipment. Empty conduits to the indicated equipment from a point 5 feet outside the building wall and 2 feet below finished grade are specified in Section 16415 ELECTRICAL WORK, INTERIOR. After installation of cables, conduits shall be sealed to prevent moisture or gases from entering the building.

### 3.6 DUCT LINES

#### 3.6.1 Requirements

Numbers and size of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short radius manufactured 90 degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inches in diameter, and 36 inches for duct 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells when duct lines terminate.

#### 3.6.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and shall match factory tapers. A coupling recommended by the duct manufacturer shall be used when an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

#### 3.6.3 Nonencased Direct-Burial

Top of duct lines shall be not less than 30 inches below finished grade and shall be installed with a minimum of 3 inches of earth around each duct, except that between adjacent electric power and communication ducts, 12 inches of earth is required. Bottom of trenches shall be graded toward manholes or handholes and shall be smooth and free of stones, soft spots, and sharp objects. Where bottoms of trenches comprise materials other than sand, a 3 inch layer of sand shall be laid first and compacted to approximate densities of surrounding firm soil before installing ducts. Joints in adjacent tiers of duct shall be vertically staggered at least 6 inches. The first 6 inch layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in 3 to 6 inch layers. Duct banks may be held in alignment with earth. However, high tiered banks shall use a wooden frame or equivalent form to hold ducts in alignment prior to backfilling.

#### 3.6.4 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendation for the particular type of duct and coupling selected and as approved.

#### 3.6.4.1 Plastic Duct

Duct joints shall be made by brushing a plastic solvent on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4 turn to set the joint tightly.

#### 3.6.5 Concrete

Concrete work shall be as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Concrete shall be plain, 2500 psi at 28 days, except that reinforced concrete shall be 3000 psi at 28 days.

#### 3.6.6 Duct Line Markers

A 5 mil red colored plastic tape, not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers with a continuous metallic backing and a corrosion-resistant 1 mil metallic foil core to permit easy location of the duct line, shall be placed approximately 12 inches below finished grade levels of buried lines.

#### 3.7 HANDHOLES

The exact locations shall be determined after carefully considering the locations of other utilities, grading, and paving. Exact locations shall be approved before construction is started.

##### 3.7.1 Construction

Handholes shall be constructed as indicated on drawings, including appurtenances. Top, walls, and bottom shall consist of reinforced concrete. Walls and bottom shall be of monolithic construction. Concrete shall be 3000 psi at 28 days. Precast concrete handholes having the same strength and inside dimensions as cast-in-place concrete handholes may be used. In paved areas, the top of entrance covers shall be flush with the finished surface of the paving. In unpaved areas, the top of entrance covers shall be approximately 1/2 inch above the finished grade. Where finished grades are in cut areas, unmortared brick shall be installed between the top of handhole and entrance frame to temporarily elevate the entrance cover to existing grade level. Where duct lines enter walls, the sections of duct may be cast in the concrete or may enter the wall through a suitable opening. The openings around entering duct lines shall be caulked tight with lead wool or other approved material.

##### 3.7.2 Appurtenances

The following appurtenances shall be provided for each handhole.

##### 3.7.3 Ground Rods

In each handhole, at a convenient point close to the wall, a ground rod conforming to paragraph GROUNDING shall be driven into the earth before the floor is poured; approximately 4 inches of the ground rod shall extend above the floor after pouring. When precast concrete units are used, the top of the ground rod may be below the floor; a No. 1/0 AWG copper ground conductor shall be brought inside through a watertight sleeve in the wall.

#### 3.8 POLE INSTALLATION

Pole lengths shall provide a luminaire mounting height as indicated on the drawings. Electrical cabling shall be provided to the light pole as specified in Section 16120 INSULATED WIRE AND CABLE. The mount interfaces shall have ac power connected, and the pole wiring harness shall be connected to the luminaire. Light poles shall not be installed outside the site or inside the perimeter zone. Pole installation shall conform to the manufacturer's recommendations, NFPA 70, and IEEE C2. Poles shall be set straight and plumb.

#### 3.8.1 Pole Brackets

Brackets shall be installed as specified by the manufacturer and as shown on drawings. Mounting hardware shall be sized appropriately to secure the mount, luminaire, and housing with wind and ice loading normally encountered at the site. Pole brackets for floodlights shall have the number of tenons indicated, arranged to provide the indicated spread between each tenon. Where indicated on drawings, adjustable heads shall be installed on the brackets to position the luminaires. Identical brackets shall be used with one type of luminaire.

#### 3.8.2 Concrete Foundations

Concrete foundations shall have anchor bolts accurately set in the foundation using a template supplied by the pole manufacturer. Once the concrete has cured, the pole shall be set on the foundation, leveled on the foundation bolts, and secured with the holding nuts. The space between the foundation and the pole base shall be grouted. Concrete and grout work shall conform to Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Concrete shall be 3000 psi at 28 days, or as indicated on the drawings, whichever is greater.

#### 3.8.3 Rigid Conduit Ells

Rigid conduit ells shall be provided where specified or indicated on drawings.

#### 3.8.4 Aluminum and Steel Pole Installation

Poles shall be mounted on cast-in-place foundations. Conduit elbows shall be provided for cable entrances into pole interiors.

##### 3.8.4.1 Cast-In-Place Foundations

Concrete foundations, sized as indicated, shall have anchor bolts accurately set in foundations using templates supplied by the pole manufacturer. Concrete work and grouting is specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. After the concrete has cured, pole anchor bases shall be set on foundations and leveled by shimming between anchor bases and foundations or by setting anchor bases on leveling nuts and grouting. Poles shall be set plumb. Anchor bolts shall be the manufactures standard, and not less than necessary to meet the pole wind loading and other specified design requirements.

### 3.9 LIGHTING

#### 3.9.1 Lamps

Lamps of the proper type, wattage, and voltage rating shall be delivered to

the project in the original containers and installed in the fixtures just before completion of the project.

### 3.9.2 Fixture Installation

Standard fixtures shall be installed as detailed on drawings. Illustrations shown on these sheets or on the drawings are indicative of the general type desired and are not intended to restrict selection of fixtures to any particular manufacturer. Fixtures of similar design, equivalent light-distribution and brightness characteristics, and equal finish and quality will be acceptable as approved. However, fixtures so noted to match existing must match exact make, model, and manufacturer in order to provide for interchangeable parts and materials for maintenance purposes, inventory control, and uniformity in application.

#### 3.9.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be installed as required for proper installation.

#### 3.9.2.2 In-Line Fuses

An in-line fuse shall be provided for each luminaire and outlet.

#### 3.9.2.3 Special Fixtures

The types of special fixtures are designated by letters and numbers. For example, SP-1 denotes special type 1.

### 3.10 LIGHTING CONTROL SYSTEM

#### 3.10.1 Photo-Control

Lighting luminaires shall be controlled in banks by a single photo-control element mounted within each bank or individually controlled by photo-control elements mounted on the heads of the luminaires.

#### 3.10.2 Time Control Switches

Switches shall be installed with not less than four 1/4 inch bolts. The use of sheet metal screws will not be allowed.

#### 3.10.3 Magnetic Contactors

Terminal lugs shall be coordinated with the wire size. Switches shall be securely fastened to the supporting structure or wall using not less than four 1/4 inch bolts. The use of sheet metal screws will not be allowed.

### 3.11 GROUNDING

Grounding shall be in conformance with NFPA 70, the contract drawings, and the following. Grounding conductors shall be soft-drawn, stranded copper. Ground rods shall be driven into the earth so that after the installation is complete, the top of the ground rod will be approximately 1 foot below finished grade, except in handholes.

#### 3.11.1 Ground Rods

The resistance to ground shall be measured using the fall-of-potential

method described in IEEE Std 81. The maximum resistance of a driven ground rod shall not exceed 25 ohms under normally dry conditions. Whenever the required ground resistance is not met, additional electrodes shall be provided interconnected with grounding conductors, to achieve the specified ground resistance. The additional electrodes shall be 8 feet long rods spaced a minimum of 10 feet apart, 5/8 inch in diameter, up to 30 feet long, driven perpendicular to grade. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately. Connections below grade shall be fusion welded. Connections above grade shall be fusion welded or shall use UL 467 approved connectors.

#### 3.11.2 Items to be Grounded

Ground conductors, metallic conduits, junction boxes, and noncurrent-carrying metallic parts of equipment shall be grounded. Connections above grade shall be made with solderless connectors, and those below grade shall be made by a fusion-welding process.

#### 3.11.3 Lighting Pole

One ground rod shall be provided at each pole. Bases of metal or concrete lighting poles shall be connected to ground rods by means of a minimum No. 8 AWG bare copper wire.

### 3.12 TESTS

#### 3.12.1 Operating Test

After the installation is completed and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements specified. The test shall be performed in the presence of the Contracting Officer. The Contractor shall furnish instruments and personnel required for the test, and the Government will furnish the necessary electric power.

#### 3.12.2 Ground Resistance Measurements

The resistance to ground shall be measured by the fall-of-potential method described in IEEE Std 81.

The contractor shall maintain a separate set of drawings, elementary diagrams and wiring diagrams of the lighting to be used for "as-built" drawings. This set shall be accurately kept up to date by the Contractor with all changes and additions to the lighting system. In addition to being complete and accurate, this set of drawings shall be kept neat and shall not be used for installation purposes. Upon completion of the as-built drawings, a representative of the Government will review the as-built work with the Contractor. If the as-built work is not complete, the Contractor will be so advised and shall complete the work as required.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16600

ELECTRIC DRYERS

PART 1 GENERAL

1.1 SUBMITTALS

PART 2 PRODUCTS

2.1 ELECTRIC DRYER

2.1.1 Cover

2.1.2 Metal Parts Other Than Castings

2.1.3 Motor

2.1.4 Heating Element

2.1.5 Timer

PART 3 EXECUTION

3.1 INSTALLATION

-- End of Section Table of Contents --

SECTION 16600

ELECTRIC DRYERS

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Electric Hand Dryer; GA

Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, operation instructions, and cleaning instructions.

PART 2 PRODUCTS

2.1 ELECTRIC DRYER

Electric hand dryers shall be Model "A". Units as manufactured by World Dryer Corporation or approved equal shall be used. The entire hand dryer shall be listed under re-examination service of Underwriter's Laboratories, Inc.

2.1.1 Cover

Cover of dryer shall consist of a one-piece gray iron casting fitted with isolated pushbutton, revolving nozzle and recessed instruction plate. All exposed portions of iron casting shall be finished with acid resisting porcelain enamel; color as selected by Contracting Officer. Cover shall be fastened by two recessed allen head specially constructed tamper-resistant bolts to aluminum base which in turn shall be fastened to the wall by 4 concealed 1/4 inch mounting bolts. The cover shall be equipped with an air inlet opening on the bottom side of the casting covered with an expanded metal grille having vanes with a minimum depth of 1/4 inch and a maximum spacing between vanes of 1/4 inch. The cover shall also be equipped with an air outlet opening on the front side of the casting covered with a metal grille having vanes with a minimum depth of 5/8 inch and a spacing between vanes of 1/4 inch.

2.1.2 Metal Parts Other Than Castings

All metal parts other than castings are to be plated with either cadmium (minimum thickness 0.003 inch) or with brightly polished chrome (minimum copper 0.0003 inch, minimum nickel 0.0005 inch, minimum combined copper and nickel 0.001 inch, minimum chrome 0.0001 inch).

2.1.3 Motor

The motor shall be of universal type, 1/10 horsepower, 7,500 rpm at rated load, with resilient mounting and sealed, lubricated ball bearings. The motor shall be protected by a fuse. A dynamically balanced fan shall be mounted directly on the motor shaft. The fan and motor unit shall be insulated from balance of dryer with rubber resilient mounting, the rubber being stressed in shear to eliminate transmission of sound to the wall. The fan shall be a double inlet centrifugal type and shall deliver a minimum of 152 cfm at the discharge end of the nozzle.

2.1.4 Heating Element

The heating element shall be protected by an automatically resetting circuit breaker mounted directly on the heating element frame within the convolutions of the coil which shall open whenever the airflow is cut off and which shall close automatically as soon as the airflow is resumed.

2.1.5 Timer

The timer shall be designed to operate the hand dryer for a period of 30 seconds after actuation by the pushbutton.

PART 3 EXECUTION

3.1 INSTALLATION

Install all electric hand dryers as shown on the drawings.

-- End of Section --